

Department of Social Systems and Management
Discussion Paper Series

No. 1223

Exploring New Socio-Economic Thought for a Small and Narrow Earth

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December 2008

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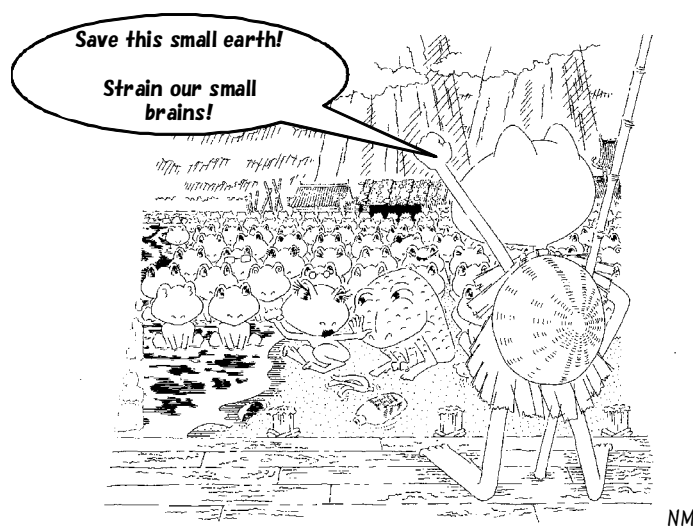
Exploring New Socio-Economic Thought for a Small and Narrow Earth¹

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December 2008, January 2009

Abstract: As the earth has been getting smaller and narrower with human activities, we should take seriously into account the size of the entire earth for human activities. This requires us to rethink and reflect upon the very existence of human beings, nations, and the entire world. It is an urgent task for social scientists to explore and study new socio-economic thought for the age of the small and narrow earth. In this article, we will scrutinize closely the present socio-economic thought, and then will explore possible socio-economic thought and social science for the present and future earth.



Frogs, more generally, amphibians are threatened worldwide by the deadly chytrid fungus.

1. Market Economy in the Small Earth

As the century has turned into the 21st, we continue to witness poverty, famine, hunger, deadly diseases, genocide, and other serious problems. Although those have been problems at any time of our history, a new salient factor has emerged as human economic activities have become no longer negligible relative to the size of the entire earth. The sizable impact of human economic activities on the earth requires us to rethink the foundations of the standard economic thought and theory. In this article, we

¹ The author thanks N. Berg and J. J. Kline for many helpful comments on earlier drafts. Also, he thanks various people including K. Tadenuma and K. Suga for comments.

explore a theory of new socio-economic thought taking the impact of human economic activities on the entire earth seriously into account. It gives some new ideas for attacking the serious world-wide problems mentioned above.

Economics as Science and Thought

Economics has two sides; social science and social thought. The former is to observe and study objectively the economic structures and the behavior of economic agents. On the other hand, the latter is to include some thought, based on the former, about a how society should be. The economics of the first half of the 20th century emphasized its former side so that economics should be a value-free science and should be silent of normative judgments. However, since it treats people and societies, we cannot ignore the questions of how human economic lives and societies should be. The present economics still keeps a strong tradition of this value-freeness, but has slightly retreated: Instead of ignoring such normative questions, we should look for an economic science with minimum normative judgments.

Theory of Perfect Competition

The theory of perfect competition in the tradition from Adam Smith is suitable to this tradition of minimizing normative judgments. Although game theory has prevailed in the present economics, the idea of perfect competition still supports the background of the entire economics. The salient characteristic of the theory of perfect competition is to start with a very individualistic description of an individual agent (a consumer and/or a producer), restricting its scope only to economic aspects of human beings and societies. Economic aspects are activities typically directly related to consumption and production, more generally, activities materially interactive to other people. Human activities have many different aspects from economic ones, which are ignored as a result.

The theory of perfect competition as described in general equilibrium theory succeeds in explaining the behavior of the entire market economy as a harmonization of activities of many economic subjects. John von Neumann, the founder of game theory, intended to surpass the idea of perfect competition, while including descriptions of other aspects of human beings and societies (cf. von Neumann [15], [16] and von Neumann-Morgenstern [17]). However, his followers have not taken such steps toward a development of a new basic idea for the understanding of humans and society. In Section 3, we will discuss the necessity of a development in this direction. It will presently be argued that the theory of perfect competition is, in fact, used to support some social thought, but its basic structure minimizes it in the sense that each economic

agent can be unconscious about the side of social thought.

In the theory of perfect completion, given fixed prices, each consumer maximizes his utility and each firm maximizes its profits. The theory purports that a well organized market institution guarantees commodities and services are well produced and circulated. One main result, called the (first) *fundamental theorem of welfare economics*, states that the resulting outcome of the market is optimal in the sense of Pareto². It means that the market functions with no waste in production processes as well as in exchange of commodities and services.

This result is typically summarized as “optimization of economic efficiency by decentralization”. It may be easier to divide this statement into three levels: the individual level, organizational level, and entire economy level. The first is a motivation of an individual agent (laborer, employer or entrepreneur). The work environment for an individual should be designed to promote his/her work motivation. The second requires an economic organization (a private firm or a public sector) to be created so as to guarantee that each individual agent as well as each organization itself can pursue freely their profits/utilities and that efficiency is achieved for the organization as a result of their free and competitive behavior. The last level is that the total profits/utilities of the entire economy are optimized as a result of the free and competitive behavior of the economic agents and organizations in the economy.

For example, the privatization of the Japanese railway company, which took place in 1987, is based on the first two levels of the above idea, and the transition of former East-European communist economies into market economies, which started around 1990, are based on all the three levels of “optimization of economic efficiency by decentralization”. A basis of this idea or perfect competition is the *large-number assumption* that each economic agent at the individual or organizational level has many similar competitors. Under this assumption, each individual or organizational economic agent should be a price-taker (or environment-taker), and his/its pursuit of profits/utilities contributes for the entire social benefits and welfare. This is the teaching of perfect competition, specifically, the fundamental theorem of welfare economics.

Free-Market Libertarianism as Social Thought

The theory of perfect competition supports what we call *free-market libertarianism*. This school of thought takes individual economic freedom as supreme, and thus regards a socio-economic institution that is well organized and allows every agent to freely

² See Arrow-Hahn [2].

pursue his economic profit/utility as an optimal one. Notice that this is not a pure scientific assertion in that it includes the normative statement that economic institutions should be arranged for the specific aim³. It has an aspect of social thought.

Free-market libertarianism is close to political libertarianism, which asserts that everybody should be free to have any thought and his behavior should be also free unless it conflicts seriously with others'. These thoughts appear to include no normative judgments only since they do not enforce each individual agent to make a specific value judgment. However, it includes a normative judgment, indeed, in that it asserts society should allow such freedom for each economic agent. This normative judgment is problematic in the present small earth. Although political libertarianism will be relevant in the following discussions, we focus on free-market libertarianism.

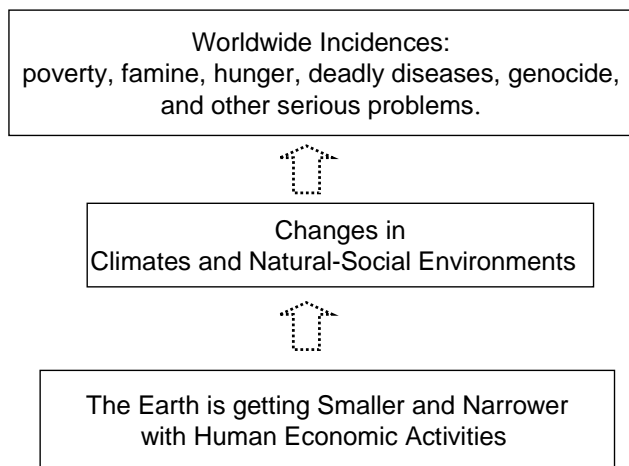


Diagram 1.1

Expansion of Human Activities in a Shrinking Earth

Many problems in the present earth suggest us to rethink free-market libertarianism. It relies upon the fundamental theorem of welfare economics above mentioned. In fact, this theorem needs, in addition to the large-number assumption, another assumption, which we call *the large-environment assumption*, that the natural environment behind the economy is large enough for economic activities to have no influence to the environment. This assumption may already be inconsistent with the large-number assumption for perfect competition, i.e., economic activities of a large number of economic agents inevitably change the environment. Thus, the fundamental theorem should be regarded only as one theorem under these seemingly incompatible

³ Pareto optimality allows many “optimal” states, and the theory of perfect competition chooses one state (some states).

assumptions, but not as the “fundamental” theorem.

What we pointed out above is often called a *market failure* in the economics literature. However, the function of market as productions and exchanges is quite another matter. An example is an economy with air pollutions by automobiles: It is convenient for each economic agent to use a car, and even though an individual agent stops using a car, his contribution for an improvement of air is negligible in the city. So, each agent continues to use a car, and pollution also continues and may become serious. However, unless the pollution escalates to the level of incurring serious damages to habitants, the market could still function to promote individual economic activities. This structure exists commonly behind problems such as global warming in the present earth⁴.

It would help our understanding to give, from the viewpoint of the history of economics, a brief look at the neglect of the large-environment assumption. Economics has a history of about 250 years from Adam Smith, and slightly more than 100 years from the beginning of the 20th century when a full-dress research was started. Now in the 21st century, the influence of human activities is entirely different at the material as well as at the cognitive level from 250 years, 100 years and even 50 years ago. The large-environment assumption might not be a problem in the age of Adam Smith. However, if we carefully look at local events in the past, we find that the large-environment assumption was already inappropriate in many places even in the time of Adam Smith. Many ancient civilizations collapsed by destroying their natural environments. In the 18th and 19th centuries, the American West was still a frontier, the natural environment there was almost infinite relative to human activities, but in the old continents which remained no longer as large environments, a lot of famines and hungers happened almost constantly and victimized many people in the 18th and 19th centuries⁵.

Exploring New Thought for the Present and Future Earth

Free-market libertarianism relies upon the neglect of the large-environment assumption and has become inappropriate for this small and narrow earth. What is now needed instead of free-market libertarianism? To make an inquiry into this question, we should first recognize that the present earth is already a small environment for human activities and the situation will get more serious in the near future. This implies that we

⁴ The author calls this a *widespread externality*. This is extensively discussed in his book [7], 3rd act. Theoretical discussions and some examples are given in Hammond-Kaneko-Wooders [4] and Kaneko-Wooders [10].

⁵ In the industry revolution of the 18th century in England, the large-number assumption, rather than the violation of the large-environment assumption, forced laborers to have miserable lives. That is, many laborers competed for opportunities of working, which led to them to work with very cheap wages in very bad conditions. To prevent such bad working environments, working conditions such as a restriction on labor hours were introduced to labor markets. This remark is given by K. Tadenuma.

should reconsider the way of life for an individual being and the way of each nation.

Free-market libertarianism includes the beliefs of *individualism* for people, and has an implication of *sovereignty* for each nation. The former is part of free-market libertarianism and the latter is rather an indirect implication, but both are an application of the same idea to different entities. As individualism states that each person can decide his own matter himself, while sovereignty states that a nation is independent and can decide its own future. Our new socio-economic thought should include reconsiderations of both individualism for each human being and sovereignty of each nation.

The start for our inquiry is to notice that the present earth is small and narrow: The present total human population on the earth is 6.7 billion, and according to the United Nation's prediction, the total human population of the world will reach 9.1 billion in the year 2050. It would be enough to say that the total population of the year 2100 would be much beyond 10 billion. Taking these figures seriously into account, we, social scientists, have large and urgent responsibilities for exploring new socio-economic thought to govern the entire earth.

First, we need a normative theory for the idea of how to connect the entire earth as one world community to individual freedom, and second we need social science and engineering to consider practical management of local societies. For the latter, we may need individualism to a certain degree for a person and partial sovereignty for each nation, but these should not be supreme principles. We need to think about a new supreme normative principle, but for practical management, we need detailed social science and social engineering.

In Section 2, we will discuss new normative socio-economic thought, and in Section 3, we will consider required social sciences.

2. The Small Earth and the World Nation

The problems we are facing in the present earth will become more serious in 50 years, 100 years and 200 years later. We cannot expect that these problems will be resolved by economic growth and/or technological progress. Instead, those will possibly devastate the entire earth. It is urgent for us, social scientists, to construct a normative theory which gives the principle and objective for management of the entire earth. In this section, we will discuss a normative theory for the present-future earth.

Normative Theory of the World Nation

There are about 200 sovereign nations in the present earth. In the future, those nations will/should no longer be able to retain their sovereignty. The denial of the sovereignty of the present nations implies that we should consider the entire earth as unity. We call the integrated unity of the nations and people in the earth the *world nation*. By the world nation, we would look for neither a utopia nor an ideal way of management. Simply, it is supreme authority of the entire world when a final decision at the entire level is needed.

Even though it is supreme authority, the earth has too many people and local regions to be governed. We should forget to the possibility of practical management of the entire earth solely by the world nation. For practical management of the earth, we will need decentralization, which appears contradictory to the world nation as supreme authority. What the world nation can do is only to coordinate and control a decentralized system. For the same reason, we cannot predict what would happen in the present and future earth; there may be poverty, famines, hungers, deadly diseases, genocides etc. If an event is serious either locally or globally and it is not or cannot be resolved by local authorities, the world nation should intervene in the event. However, the world nation needs a certain normative theory for such an intervention.

Since many local and global events will possibly occur in the present and future earth, the normative theory should have a scope large enough to evaluate each of possible events: For example, the scope should include genocides such as ones occurred in Cambodia of 1970's and the Congo area in 1990's, and famines and hungers occurring in the present sub-Saharan Africa. Also, the scope should include the possible world-wide disaster in the near future due to the greenhouse effect and worldwide over-population. When the earth is running well, we would not need the normative theory; but we do need it when some very bad events happen or are expected to happen. To have all possible bad events in the scope of the theory, we should think of the ultimate worst possibility for the entire earth.

In fact, this problem of the ultimate worst possibility was discussed by two great thinkers. They are the 17th century philosopher, Thomas Hobbes, and the 20th century physicist, Albert Einstein. Hobbes was the initiator of social-contract theory, and put the worst scenario as the basis for his social-contract theory of a nation. Einstein considered the total destruction of the earth by nuclear bombs as the worst possibility for the earth.

Hobbes's Social-Contract Theory of a Nation

Thomas Hobbes belonged to the 17th century, and he mentioned nothing about the

small-narrow earth and the world nation. Nevertheless, the logic of his social-contract theory of a nation described in his “*Leviathan*” [5] can almost directly be extended into the social-contract theory of the world nation. In order to study the origin of a nation, he considered the hypothetical state of the society, called the “*state of nature*”, by eliminating all social institutions and governmental authorities for protection of the individual rights from the present society. In the state of nature, since no authorities protect and control people’s rights and duties, everybody owns the unbounded rights for everything. These rights contradict each other, and lead the state of nature to “*a war of all against all*”, where everybody robs everybody else: Hobbes described the state of nature as “*In such condition, there is no place for industry; ... no culture of the earth; ... no arts; no letters; ... and the life of man, solitary, poor, nasty, brutish, and short*”. To avoid this cruel state, every individual being gives up and provides almost all rights to the nation, and agrees a social contract to have the central authority for governing the nation⁶.

This is the mechanism of the origin/emergence of a nation. It should be emphasized that this is intended to be not a historical mechanism but the logical mechanism of the origin/emergence of a nation.

Einstein’s Principle for World Peace

In a paper on the special relativity theory published in 1907, Albert Einstein derived the conclusion that mass might be transformed into energy: If mass m is changed into energy E , it obeys the formula $E = mc^2$, where c is the speed of light and is gigantic (about 300,000km/sec). Hence, even if a small amount of mass is changed into energy, the tremendous amount of energy would be released. In the 1940’s, atomic bombs became technically possible, and in 1945, atomic bombs were thrown to Hiroshima and Nagasaki victimizing 300~400 thousands of people. In the 1950’s, the USA and USSR (the present Russia) already kept a sufficient number of atomic-hydrogen bombs to destroy the entire earth.

In the 1940’s, Einstein recognized the crisis of the earth, and faced the fact that the earth was no longer an infinite environment for human beings. Being apprehensive of human race in the earth, Einstein wrote in a letter to a Russian scientist in 1949:

(*): The objective of avoiding total destruction must have priority over any other

⁶ Hobbes [5] himself went to the conclusion of the “political absolutism” to centralize all the rights to the nation except for a small number of “natural rights” for individual members. The present author regards this conclusion as possible but not inevitable from his state of nature.

objective⁷.

This has been called *the principle for world peace*.

The above principle is based on the worst possibility for the earth and human race. It differs from Hobbes' time that human beings can now destroy the entire earth including themselves. Taking this extreme case as the reference point, we can think about any events to possibly occur in the earth in a relativistic manner.

The Hobbes-Einstein Social-Contract Theory of the World Nation

Our normative theory for the world nation is obtained from the Hobbes's social-contract theory by substituting the destruction/annihilation of the entire earth and human race for Hobbes's state of nature. This theory can compare any serious events to possibly occur in the present-future earth with the reference point of the total destruction of the earth. In the following, we will discuss some implications of this theory, and also we will see its limitations.

First, we will see an implication of our normative theory on individual rights and duties. As we have combined the worst case of total destruction of the earth with Hobbes's logic, we have an extreme implication very different from the present thought about rights and duties for an individual being. To understand this extreme implication, we note that free-market libertarianism inevitably involves a certain contradictory aspect.

The property rights are very basic for free-market libertarianism, that is, ownerships for properties and more generally individual lives are protected by a law and police power from stealing, robbing and killing. This legal and police power needs to be financed by a tax system, which is already a partial denial of property rights. Free-market libertarianism itself requires some central authority.

Abrogation of Vested Rights and Interests

Even free-market libertarianism involves its partial denial. When we pursue the other extreme, i.e., the Hobbes-Einstein social-contract theory for the world nation, the denial becomes extreme. Therefore, we must reflect upon some individualistic tendency of our thinking coming from the present "modern" society.

We, living in "modern" societies, typically have the implicit belief that each individual being has or should have integrity, meaning that his/her identity belongs to

⁷ Einstein [1], p.146.

himself/herself. Also, many people believe “sovereignty” of a nation meaning that it retains vested rights and interests. Let us consider this literally: Even though people in developed nations know that many people in Africa are waiting for death from famines, hungers, and genocides, the former people have no duties (no rights) and can (should) ignore it because they have their own sovereignty, as so do the latter people. A main cause for droughts in Africa is from economic activities in developed nations. Typical conventional thought is to find a line to divide causes between developed and African nations. This gives only a temporal resolution, but is meaningless at the principle level. All things considered, we should abrogate vested rights and interests of people as well as nations. In fact, this is an implication of the Hobbes-Einstein social-contract theory for rights and duties.

The Principle of the World Human Community

Let us formulate the above implication in the following general form:

() The body and talent of every human individual belongs to the world human community in the earth, and the world human community owns all rights for them. The world human community consists of all human individuals in the earth, and everybody has the right to the entire community.**

We call this (**) the *principle of the world human community*. This principle abrogates all the vested interests and rights of all people and nations. This is the supreme normative principle for individual rights. Practically, we cannot directly follow (**) in all the cases; when we need the very basis of our normative principle, we should recall the principle (**).

Let us apply the principle (**) to people waiting for death by famines, hungers, or genocides in Africa. According to (**), the economic capitals of developed nations but also the existences (bodies and talents) of people there belong to the world human community. It is a legitimate right for the suffering people to demand people in the developed nations to save them. The people in developed nations cannot ignore those demands, but it is their duty to save the suffering people, by sacrificing rich lives. Also, it is a duty for all the people in the world to immediately stop genocides. Neither sovereignty nor the “nonintervention of the affairs of other nations” can be applied here.

The Nash Social Welfare Function

The above is the skeleton of the normative theory of the world nation for the

present-future earth. One mathematization of the above argument is the theory of the *Nash social welfare function* proposed in Kaneko-Nakamura [9]. It is given as

$$W(x) = \sum_{i=1}^n \log(u_i(x) - u_i(x_0)), \quad (1)$$

where $i = 1, \dots, n$ are the members of the world nation, u_i is the utility function member i in the sense of expected utility theory, x is a world state to be evaluated, and x_0 is the total destruction/annihilation of the earth and human race.

Let us apply the Nash social welfare function to the above mentioned problem of famines/hungers/genocides. The world state x includes the deaths of suffering people in the near future. For any person i of these people, this state x is very close to the total destruction/annihilation x_0 , but it could be assumed that the utility value $u_i(x)$ is still higher than the utility $u_i(x_0)$. Then, the utility difference $u_i(x) - u_i(x_0)$ is positive but close to 0, equivalently, $\log(u_i(x) - u_i(x_0))$ is almost $-\infty$. This means that the total social welfare $W(x)$ is also almost $-\infty$. Hence, the Nash social welfare function suggests avoiding the world state x and choosing any world state y stopping deaths from famines/hungers/genocides by sacrificing rich lives of people in developed nations.

Mathematically speaking, the Nash social welfare function of (1) is a different representation of an n -person version of the Nash bargaining solution given by Nash [11]. The main difference is that in the former, the disagreement point is the total destruction/annihilation of the earth and human race, while in the latter, the disagreement point is given or determined in each economic situation.

By associating the Nash bargaining theory of [11] with the Nash social welfare function, the feature of the social-contract of our normative theory becomes more explicit and may be described as follows. Everybody has a button he can push to destroy the earth and its inhabitants. In this way, every decision needs to be unanimously agreed to relative to the disagreement point of total destruction. Here, nobody can guarantee all his vested rights and interests since his attempt to keep them might lead to his nonexistence

The above argument requires deep and stringent mathematical foundations, and indeed, such mathematical foundations should be revealed to see the scope and limitations of this theory. However, those mathematical discussions should be given in a separate paper.

Difficulties in Applications of the Principle of World Human Community

In fact, it has some conceptual difficulties in applications to general social problems.

In the above example, the lives/deaths of some people are compared with the total destruction/annihilation of the earth and human race. Here, the physiological part of “utility” dominates the social/cultural part. In general social problems, however, “utility” is more closely related to society and culture; in many cases, “utility” is formed by interactions with society. For example, red sweaters may give higher utilities to some people than blue ones, because of some psychological or social status effect. In this example, psychological part is more dominant than physiological part. A utility loss by taking blue sweaters is incomparable with that of genocide or starvation. In this example, psychological part is more dominant than physiological part: “Psychological utility” is not as important as death or lives and may not be counted in social welfare. We, as social scientists, should study the problems of what “utility” is and when it should be taken into account seriously.

In the example of famines/hungers/genocides, direct and immediate actions are required. In this sense, these do not involve an essential time structure. In many other social problems, however, we cannot directly choose resulting states; instead, we should use some social institutions to manage a problem. We cannot expect an immediate result from the choice of a social institution, but behavior of people in the institution would determine a resulting state. Unless we know human nature in society, it would be difficult to predict what would result in a given social situation under some institutional arrangement. Thus, we need to explore human nature and social behavior before applying the principle of the world human community or the Nash social welfare function to each social problem.

Real people are living in the societies with historical and geological backgrounds. They differ in their inborn abilities as well as social backgrounds. Also, their abilities are limited, formed and determined in their social backgrounds. These hinder immediate applications of the above normative theory to real worlds. Thus, in addition to the theory of the world nation as a normative theory, we need research in human nature such as emotion, reasoning and behavior, and their relationships to society and culture. And, social institutions and their management should be carefully studied. Only with such studies, we may apply our normative theory more.

In sum, we can no longer afford to be indifferent to the nature of human and social suffering and utility. The smallness of the earth demands that we take preferences of individuals and society seriously and find some normative method for comparisons.

3. Theory of the World Nation: Studies of Humans, Societies and Social Institutions

In Sections 1 and 2, we discussed the necessity of the world nation for the future earth and human race. In Section 2, we provided the normative theory to evaluate each possible world state. For concrete management of the world, however, we need more objective studies of human, society, and institutions. In this section, we discuss what kinds of studies are needed for them.

Geological and Historical Understanding of the Human World

First of all, we need to investigate what have happened, are happening, and will possibly happen in the human world. There are two kinds, *horizontal and vertical*, of researches for these questions: The horizontal research is to study what are happening in the present world, and the vertical one is to study what have happened in the past. To consider the future world of the earth, we need these two different methodologies.

From the horizontal viewpoint, we can see desertification, poverties, famines, hungers, and spreads of diseases occurring in African and Asian nations. To study people and their behavior there helps our understanding of human beings in such extreme situations. On the other hand, from the vertical point of view, we trace events in the past and might understand what social structures and social institutions might lead to some incidents or might prevent from them.

In the book [6], the present author adopted the vertical methodology to look into some Japanese histories of 400 years. Looking into Japanese societies in the past, we find some social situations which are hardly perceivable in the present Japan. For example, extreme poverty had been prevailing in the rural areas in the Tohoku region in Japan from the Edo period, which is a feudal age, until some years after the end of the World War II⁸. There, we observe that the private ownership, which is the basis of free-market libertarianism, created a small number of landlords and a large number of peasants: This is found in the Edo era as expected, but after the reform of the tax system on farm lands in 1873 (6 year later after the Meiji restoration (1868)), the percentage of peasants in the Tohoku region had increased to 45% ~ 50% in 40 years later. When weather was cold for several years, many peasants sold their daughters for prostitution in Tokyo. The concentration of land ownerships was dissolved by the Allied Powers after the World War II.

These are not only difficult to imagine from the present situation of the Tohoku region, but also give a great hint to understand human nature: Once a family had entered the class of big landlords, its descendants had a tendency to believe as if their

⁸ Tohoku is the north east area of the main island of Japan. Edo era is the period from 1603 to 1867: During this period, Japan was closed from 1633 until 1858, except for a small channel (a small island in Kyushu) to the Netherland.

rights and ownerships should be eternal; that is, their conservative thinking is emerging. To understand such conservativeness, we need to understand human nature.



Study of Human Nature

Looking at the human model in the present economics and game theory from the above point of views, we find that those theories have too narrow perspectives to discuss human nature. The human model in economics/game theory consists of information processing ability, perception of available actions, and objective function to be pursued. A reasoning ability is often emphasized but only an interpretation of it is attached to the model. Such an interpretation is typically arbitrary and is adapted to the purpose of a writer. Giving a rigorous definition of a “reasoning ability” may identify their difficulties involved in the present economics and game theory. Reasoning is only one aspect of human nature among others. To understand limitations on human thinking and a variety of emotional propensities, we must study the functions of internal structures of a human being.

While the above conclusion sounds to suggest a reduction of social sciences to psychological, physiological and/or biological studies of a human being, the present author has a very negative opinion about it⁹. Nevertheless, he believes that a mechanical view of a human being is needed to understand even social problems. A human being is a highly social creature in the sense that he has a lot of superstructures (software) formed with social interactions, based inborn substructures (hardware). The author does not intend to deny an importance of the latter, but he thinks that the former must be the target of social science: We should study these superstructures.

Here, we consider some hints given by Hobbes. He described a detailed model of a

⁹ This part needs a methodological consideration. See Kaneko [7], Act 5.

human being in his “*Leviathan*” [5], which can be characterized as a machinery view of a human being. The machinery model is autonomous and governed by emotions, cognition and intelligence. Hobbes described a human being as a finite machine without referring to any myth.

One who received medical treatment in a modern hospital notices that medical treatment is similar to repair of an automobile in a garage. In the case of detachment of the retina, the detached retina is fixed with the base of the eye ball by laser beams. In the case of a cataract, the crystalline lens is replaced by an artificial lens. Such mechanical repairing is not limited to ophthalmology; the modern medicine in general reminds us mechanical repair. Each part, organ, of a human is neither mechanical nor electrical, but physiological. Nevertheless, a human can be regarded as a finite machine from the viewpoint of its function.

Each physiological function of a human has been acquired for preservation of a fittest in the evolution process. The characteristic of each function is conservativeness to protect the individual or the group to which it belong. This inclination may be found also in the use of intelligence. This conservativeness makes descendants of the big landlord have an inclination to believe that their social status is eternal.

When we talk about “human nature”, it might be presumed that it exists as an inborn and unchanging ability. We should be very careful about avoiding this presumption: The hardware of a human being consists of physiological organs described above, but the software consisting of beliefs, knowledge and intelligence etc., is formed as the superstructure of the hardware. Major parts are acquired through social interactions and educations, but are not given as innate abilities. Studies of human nature mean to investigate both such hardware and software.

von Neumann’s Self-Reproducing Automaton

One extreme model, called a *self-reproducing automaton*, built by von Neumann [16] gives a great hint to the above view. He started with 29 simples cells in the 2-dimensional lattice space as the primitive units, and combined these cells to construct small organs having different functions. Then, combining those small organs, he finally constructed a self-reproducing automaton of the size about 300×400 cells. It has a universal Turing machine as its brain, and remarkably, it can create its clone. It is the point here that a finite human model is possible, though Neumann’s model has still very restrictive functions.

This is what holistic than the views in the fields of psychological, physiological or even biological studies. We need to study a human being as well as a society as a whole

so as to capture their holistic attributes: By doing so, a much richer and more complex view of a human being would emerge. Unless we pursue such an objective and somewhat holistic view, we cannot capture social phenomena since they are often inseparable from human nature¹⁰.

Management of the World Nation

As the finite nature of a human being becomes clearer, the necessity of social institutions is emerging for the management of the world nation. No institutions are needed for the world consisting of only one person. The world consisting of two people is similar, but some division of labor may be necessary. In a society having a large of people, the division of labor is essential, and some institutions implementing it become inevitable. As a result, social institutions are emerging as necessary components of the world nation.

A market system is one important social institution to implement the decentralization of the economic management of the world nation. As discussed in Section 1, the use of a market system should not be the supreme principle; it should not be universal. Instead, the restrictive use of a market system is aimed for practical management. We should always be conscious of problems induced from a market system.

It gives some information to study closely transitions from the capitalist economy to the market economy in the East European nations after 1990. For example, Poland is regarded as the most successful in those transitions, but is expected to have 5 more years to complete it; the transition takes about 25 years in total from 1990. As the polish population is about 37 millions, Poland is not a gigantic nation. It still needs 25 years for the change of the economic system. It is an urgent task for social scientists to do theoretical and empirical studies of such economic transitions and reforms.

Present Nations as Administrative Units

It is also relevant ask about the future statuses of the present nations in relation to the world nation. To consider this question, a small historical consideration may help.

In 450 years ago, the entire Japan was in the warring state and consisted of many feudal countries, each of which was supposed to have sovereignty. In 150 years ago, Japan had the Tokugawa family as the central government, but was divided into more than 300 feudal countries, which were actual administrative units and ruled by feudal

¹⁰ Methodologically, these are entangled with each other. In Kaneko [7], Act 5, the present author examined methodological individual and methodological holism using several approaches in economics and game theory, and what they really mean.

clans. Those feudal countries were much smaller than a representative prefecture of the present administrative system (48 prefectures), but each was an independent country in the perception of many habitants there. In the present Japan, nobody thinks that his prefecture forms one country. This change has happened only in 150 years. In the present European Union, the borders are practically removed, and people can move freely for a job from one nation to any other nation in the Union. In several decades, the concept of a “nation” and even “race” will possibly change drastically in the European Union.

In the 100 or 200 years future, the present nations will become administrative units and the entire earth will be governed by the world nation. The period of 25 years for an institutional change is quite long for an individual being, but the history has a much longer time scale than a human being.

Contradictory Features of the World Nation and Decentralization

The above description of the historical direction may be interpreted as meaning that the world nation could be a natural conclusion. On the other hand, we have discussed also that due to our finite and limited nature, decentralization of economic management is inevitable. Also, centralized management would be subject to risks of global instability, meaning that the entire earth may meet a worldwide disaster; this is applied not only to the entire earth but also to any large administrative unit. Nevertheless, if the world management is decentralized too much, we would meet the same problem as the present earth is facing. We, economists/game theorists, should study how we reconcile the centralized idea of the world nation with practical decentralization.

Necessity of Conceptual/Philosophical Studies

We are required to do theoretical and empirical researches of human nature, societies, and social institutions. To support these researches, conceptual/philosophical bases are vitally necessary. As we need a normative theory to discuss objectives and evaluations, conceptual/philosophical bases are necessary to direct theoretical and empirical researches: Without conceptual/philosophical bases, theoretical researches would possibly become mere mathematical generalizations or variant exercises, and empirical researches would be simple pursuits of social incidents in the real world.

The present economics/game theory cannot provide enough vocabulary for deeper discussions and investigations of human nature and society. They lack enough conceptual/philosophical vocabulary. In “*Nineteen Eighty-Four*”, George Orwell [12] wrote about a new system of language called the “new speak” forced to people. For

example, if the word “revolution” is removed from the dictionary for people, they cannot use the word “revolution” and would not be able to think about “revolution” as a concept; so no actual revolution could happen. Similarly, the present economics and game theory do not provide enough vocabulary to enable us to think about human nature and society at a deeper level.

An elimination of a word and/or a concept is a metaphor, but it is effectively observable in our profession. Here, we give two examples among others: Arrow’s [1] impossibility theorem and free use of the “probability” and “subjective probability”.

Arrow’s impossibility theorem is regarded as an important theorem in welfare economics, which means that it is impossible to find a social welfare function satisfying certain plausible conditions. One interpretation of a social welfare function typically adopted is a mechanism of aggregating the preference relations reported by the members to the mechanism. If, however, two concepts “having a preference relation” and “knowing his own preference relation” are distinguished, we would find that “each reports his own preference relation” is an unhealthy assumption, which first needs that he knows his own preference relation. However, social choice theory has been developed with neglect of this conceptual distinction.

Another example is free use of “probability” and/or “subjective probability”. To make the point clear, we consider “subjective probability” due to Savage [13]. People’s beliefs are expressed by “subjective probability”; this is supported by an “axiomatization” given by him or by his followers. However, any “axiomatization” is a characterization in term of necessary and sufficient conditions. Some people may claim “it expresses a degree or propensity of beliefs”. But this changes only its explanatory expression but gives no answer to the question of what “subjective probability” is. As far as the concept of probability is used, we confine ourselves to use it in a way clearly related to this world – only the frequentist interpretation must be used. Otherwise, we should avoid free use of “probability” in general¹¹.

Experiential Source of Beliefs/Knowledge

One research project of the author is to explore the origin/emergence of human belief/knowledge and rationality (deductive-inductive reasoning and cognitive-inferential ability) in a social context. Its entire skeleton is described by inductive game

¹¹ In the first half of the 20th century, the question of what “probability” is was discussed a lot. Among various interpretations, the frequentist interpretation is only an attempt to view “probability” from the material world. See Weatherford [14]. For expected utility theory, von Neumann-Morgenstern [17], Chap.1 explicitly stated that they adopt the frequentist interpretation.

theory¹². The emphasis of the theory is the consideration of the origin/emergence of beliefs/knowledge from the experiential point of view. By this theory, we investigate limitations of human rationality. Methodologically speaking, people's beliefs are expressed symbolically but not "subjective probability", and a structure, instead of a set of parameter values, is a target of beliefs. A lot of radical ideas are borrowed from mathematical logic, while we should keep always the empirical point of view.

By exploring a human being and society in the above mentioned manner, we will have a better understand of them: Even though people have truly limited rationalities, the society may function smoothly, and conversely, even if people are assumed to be very intelligent, the society may suffer from serious social problems such as prejudices-discrimination and severe conflicts of different groups. As we proceed with such researches, we are trying to obtain a richer scope and also to enrich our vocabulary. In doing so, we plan to construct the theory of the world nation.

4. Concluding Remarks

Summarizing the above discussions, to have socio-economic thought for the age of the earth, we are required to explore the normative theory, which was discussed in Section 2. Also, also many conceptual/philosophical, theoretical and empirical studies are required and should be synthesized, which were discussed in Section 3. These should consist of not only economics and game theory, but also need collaborations with human sciences such as political science, anthropology, literature as well as natural sciences and computer science. We need such comprehensive researches. Here, we finish this article with a remark on the use of computer simulations.

As we pointed out that a market system is unavoidable for the practical management of the entire earth to a certain degree, we need a lot of social institutions to control the entire world. For this purpose, computer simulations will help us to study how much we should adopt such social institutions such as market systems. For an actual problem, a mathematical theory gives a basic skeleton, but does not tell its details. Computer simulations give detailed information of the behavior of an institutional system.

According the present progress in computer technology, we expect, in 20~30 years, computers to have an enough ability to implement large scale social simulations. However, a development of a computer simulation model is a different matter from the development of computer technology. We need to begin to develop simulation models. In

¹² The basic research program of the author is described in [7]. More recently, Kaneko-Kline [8] has developed a new theory called *inductive game theory*. The skeleton of the theory is described in [8].

doing so, it will be possible to simulate what would happen in a theoretical model, and then we can evaluate each possible social institution. With this development, the choice and/or reform of a social institution must become possible.

References

- [1] Arrow, K. J., *Social Choice and Individual Value*, Yale University Press, (1970: original 1951), New Heaven.
- [2] Arrow, K. J., and F. H. Hahn, *General Competitive Analysis*, (1971), Holden-Day, San Francisco.
- [3] Einstein, A., *Ideas and Opinions*, Bonanza Books, (1986), New York.
- [4] Hammond, P. J., M. Kaneko, and M. H. Woosers, Continuum economies with finite coalitions: core, equilibria and widespread externalities, *J. Econ. Theory* 49 (1989), 113-134.
- [5] Hobbes, T. *Leviathan*, Cambridge University Press (1991: the original 1651), Cambridge.
- [6] Kaneko, M., *Social Justice – considered in Hell* (in Japanese), Keiso-shobo, (2007).
- [7] Kaneko, M. *Game Theory and Mutual Misunderstanding*, Springer Verlag, (2004).
- [8] Kaneko, M., and J. J. Kline, Inductive Game Theory: A Basic Scenario, *J. Math. Economics* 44 (2008), 1332-1363.
- [9] Kaneko, M. and K. Nakamura, The Nash Social Welfare Function, *Econometrica* 47, (1979), 423-435.
- [10] Kaneko, M., and M. H. Wooders, Widespread externalities and perfectly competitive markets: Examples, *Imperfection and Behavior in Economic Organizations*, eds. R. Gilles and P. Ruyes, Kluwer Academic Publisher, (1994), 71-87.
- [11] Nash, J. F., Two-person bargaining game, *Econometrica* 18 (1950), 155-162.
- [12] Orwell, G., *Nineteen Eighty-Four*. New American Library, New York, (1949).
- [13] Savage, L. J. *The Foundations of Statistics*, John Wiley and Sons, New York, (1954).
- [14] Weatherford, Roy, *Philosophical Foundations of Probability Theory*, Routledge & Kegan Paul, London, (1982).
- [15] von Neumann, J., A Model of General Equilibrium, *Review of Economic Studies* 13 (1945), 1-9. (German original: 1937).
- [16] von Neumann, J., *Theory of Self-Reproducing Automata*. (Burks A. W. editing and completing), (1966), University of Illinois Press, Chicago.
- [17] von Neumann, J., and O. Morgenstern, *Theory of Games and Economic Behavior*, Princeton University Press, (1944), Princeton.