Exploring New Socio-Economic Thought for a Small and Narrow Earth[1]

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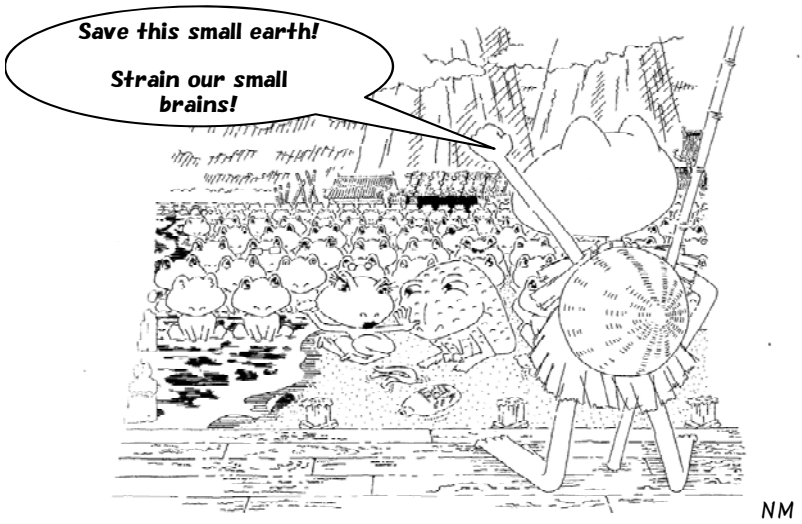
Abstract: As the earth has been getting smaller and narrower with human activities, we should take seriously the size of the earth into account for considerations of social phenomena and societal problems. This requires us to rethink and reflect upon the very existence of human beings, societies, nations, and the entire world. It is an urgent task for us, social scientists, to explore and study new socio-economic thought for this small and narrow earth. We are led to a consideration of a normative theory for the earth as unity, and also to various theoretical and empirical studies for practical management of the earth. Although we will see that these are contradictory in various respects, we should, at least, try to reconcile them to save our future.



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

1. Conflicting Features in a Small and Narrow Earth

As the century has turned into the 21st, we continue to witness poverty, famine, hunger, deadly diseases, conflicts, wars, genocides, and other serious problems in the world. Although those incidents have been problems at any time of our history, they are becoming worldwide problems as human economic activities with technological/ informational progress are more significant relative to the size of the earth. These

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sizable impacts of human economic activities on the earth require us to rethink new socio-economic thought and also to consider the management of the entire earth by taking the influences of human economic activities on the earth into account. In this article, we, as social scientists, explore what we should and can do for the future earth.

Economics as Science and Thought

Although economic activities are one among many social aspects of human worlds, they become more important as people pursue materially richer lives. This tendency is getting stronger as technology is progressing, with which the earth is even getting smaller and narrower. In this section, first, we look at how the present economics thinks, and also consider, from the viewpoint of the entire earth, what the important issues are. In Sections 3 and 4, we will discuss other social aspects of human worlds.

Economics has two sides; social science and social thought. The former is to study objectively the economic structures and behavior of economic agents. The latter includes some normative judgments, based on the former, about how society should be. The economics of the 20th century emphasized its former side so that economics should be a value-free science; it 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 tradition of this value-freeness, but has slightly retreated: Instead of ignoring such normative questions, it looks for an economic science with minimum normative judgments.

Also, the present economics has a strong tendency to focus only on economic aspects as if all social aspects could be treated in the same manner. In this article, we will take the position that economic aspects are only part of the entire human worlds. From this perspective, we should critically investigate the foundations of the present economics. We now start with its benchmark. Based on the discussions in this section, we will discuss the normative theory and required social thought and sciences in Sections 2--4.

Theory of Perfect Competition

The theory of perfect competition in the tradition from Adam Smith is suitable to the research attitude of minimizing normative judgments. The salient characteristic of the theory of perfect competition is to start with a very individualistic description of an economic agent (a consumer and/or a producer), restricting its scope only to economic aspects of human beings and societies, i.e., related to production and consumption (and, financial aspects as well). As a result, it is ignored that society has many other aspects different from economic ones. Nevertheless, the theory of perfect competition as

described in general equilibrium theory succeeds in explaining the behavior of the market economy as a harmonization of activities of many economic agents.

Game theory has been regarded as supplements for the theory of perfect competition to allow us more micro behavior of people and societies. 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 [28], [29] and von Neumann-Morgenstern [30]). However, his followers have not taken such steps toward a development of a new basic idea for the understanding of humans and society: So far, game theory is effectively included in economics and its teaching is not very different from the theory of perfect competition. In Section 3, we will discuss the necessity of a development in the direction von Neumann addressed. It will be presently argued that the theory of perfect competition is, in fact, used to support some social thought, but its basic structure succeeds in minimizing normative judgments in the sense that each economic agent can be unconscious about the side of its 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 to be suitably 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 Pareto[2]. It means that the market functions with no waste in production processes as well as in distributions (exchanges) 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 for an individual agent (laborer, employer or entrepreneur). The work environment for each agent 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 the organization itself can pursue freely their profits/utilities and that efficiency is achieved for the organization as a result of their free behavior. The last level is that the total profits/utilities of the entire economy are maximized 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 divided into several independent companies, which took place in 1987, is based on the first two levels of the above idea to eliminate legal constraints on decision making by workers and

[2] See Arrow-Hahn [2].

organizations, and on the third level indirectly in the sense that each has at least some competitors. The transition of former East-European communist countries into market economies, which started around 1990, is based more clearly on all the three levels of decentralization.

A basis of the idea of perfect competition is the *large-number assumption* that each economic agent at the individual or organizational level has many (or at least several) 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 the theory of perfect competition, specifically, the fundamental theorem of welfare economics.

Free-Market Libertarianism (Individualism) as Social Thought

The theory of perfect competition supports what we call *free-market libertarianism*. This school of thought takes individual economic freedom as the supreme principle, and thus regards a socio-economic institution allowing every agent to freely pursue his economic profit/utility as an optimal one[3]. However, this already includes a normative judgment in that society should allow such freedom for each economic agent as much as possible and political/legal systems should be arranged to support this idea. Although it asserts to maximize individual freedom, some political and institutional arrangement of society, e.g., basic property rights, is inevitably needed.

Since a political institution finally chooses a social system, we should mention the political counterpart of free-market libertarianism: It is political libertarianism, which asserts a minimum political system to support individual freedom. These two thoughts appear to include no normative judgments, but make the normative judgment that such individualistic freedom has the supreme value. These include typically the presumption that each person's ownership including property rights is for granted. This is seriously problematic in the present small and narrow earth. Now, we cannot avoid value judgments of each person, each community, each society, and the world.

Expansion of Human Activities in a Shrinking Earth

Many problems in the present earth suggest us to rethink free-market libertarianism (and individualism). In the world, there are many societies with different cultural traits incompatible with free-market libertarianism, for example, family ties

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

are outside of economic lives and are still very important in many Asian countries. Religions are substantial part of society and human lives in the world, even in Europe and North America. These societal aspects constitute the substructures for economic lives and activities. Here, we postpone our discussions on societal and cultural aspects to Sections 3 and 4: Instead, we look at free-market libertarianism from the viewpoint of economics itself taking the smallness and narrowness of the earth.

As mentioned above, free-market libertarianism relies upon the fundamental theorem of welfare economics. In fact, in addition to the large-number assumption, this theorem needs another assumption, which we call *the large-environment assumption,* that the natural environment behind the economy is large enough for economic activities to have only negligible influence to the environment. This assumption may already be inconsistent with the large-number assumption; that is, economic activities of a large number of economic agents almost necessarily change the environment. The fundamental theorem should be regarded just as one (not really fundamental) theorem under these seemingly incompatible assumptions[4].

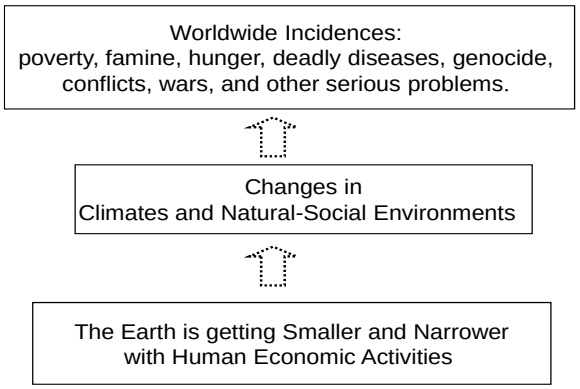

Diagram 1.1

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 problem. 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. Unless the pollution escalates to the level of incurring serious damages to inhabitants, the market could still function to promote individual economic activities. The market itself is an engine to generate and often magnify the environmental problem. This structure exists commonly behind problems such as global warming in the present

[4] though they are mathematically consistent.

earth[5]. Diagram 1.1 describes this causal relationship.

It may help our understanding to give a brief look at the history of economics. 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 full-dress research was started. Now in the 21st century, the influence of human activities is entirely different at the material and cognitive levels from 250 years, 100 years and even 50 years ago. The large-environment assumption might not be a problem in the time of 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. Various 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 centuries.

The above point is confirmed by looking at the world populations of the past and future. The world population exceeded 1 billion in the beginning of the 19th century; it reached 3.0 billion in 1930 and 4.0 billion in 1965. 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, the large-environment assumption is no longer valid; we cannot keep free-market libertarianism (and the fundamental theorem of welfare economics) as a sound basis of social-economic thought for the present-future earth.

Globalization: Explosive Progress of Information and Transportation Technology

Another important fact we should admit is the rapid progress in information and transportation technology. Scientific knowledge and technological progress are explosive as a whole, which may support globalization of economic and industrial activities. This makes the worldwide trades possible, but at the same time, it generates a lot of social problems; an obvious example, other than global warming, is the instability of the worldwide market, e.g., the 2008/2009 financial crisis. Some local event may influence the worldwide market so rapidly through information channels; this entirely differs from the world of 30 years ago. In fact, the concept of perfect

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5 The author calls this a *widespread externality*. This is extensively discussed in his book [12], 3rd act. Theoretical discussions and some examples are given in Hammond-Kaneko-Wooders [7] and Kaneko-Wooders [18].

competition requires also informational decentralization, too, and is not compatible with rapid spreads of information[6]. This requires us to rethink the present economics and game theory.

A manifestation of explosive progress of information technology is the financial market: In 2004, the daily average of the worldwide exchanges is about $1.4 trillion, but that of the real trades is about $20 million. That is, about 70 times of real trades is occurring. This is only possible with progress in rapid informational technology.

Steady Slowness: Diversified Cultures and Values in the World

We are apt to think that the entire world can and/or does move in the same direction by globalization and people will have the same and uniform values in the near future. This inclination is caused by the negligence of local social backgrounds surrounding each person: While accumulated knowledge and technology in the human world are getting larger, the ability of an individual being remains, more or less, unchanged. At the superficial level, technological progress will give more global information, but at a slightly deeper level, each person is created by his family and community in that he follows the patterns of behavior and thinking developed in his community and its local history. This locality leads to a great social diversity of cultures, languages, religions, values, etc. in the world, which together with globalization cause inevitable serious conflicts between groups of different cultures. This will be discussed in Section 3 from the viewpoint of inductive game theory.

The above fact is confirmed by looking at the evidence that the worldwide illiteracy rate in 2008 is still more than 20%, and that there are many developing nations having significantly higher illiteracy rates. This implies the existence of a big barrier to exclude illiterates from economic activities to be supposed in the present economics and game theory.

Thus, the present world shows explosive progress of informational technology, and only some people in some nations are enjoying prosperities brought about by such technological progress, only sacrificing many other people and denying many background cultures.

Unity of the Earth vs. Diversity of Cultures in the Earth

Thus, we are meeting various contradictory problems occurring in the earth. The one is that the earth is small and narrow with the growth of human population and explosive technological progress, which implies that individualism such as free-market

[6] See Kaneko [13], Act 3, Scene 3, p.106.

libertarianism can no longer be suitable social thought. This will be discussed as a normative theory for the future earth as unity in Section 2. On the other hand, we should admit a great variety of human cultures, and it would be difficult to think about unified ways of practical management of the earth.

Those contradictory problems may have no reconciliation, but at least we should look at them seriously. We need to look at the entire earth as a unity, but for practical managements, we should also take great diversity of cultures, religions, behavior, and ways of thinking into account. In this article, we explore new socio-economic thought for the future earth having many conflicting aspects and ideas.

In Section 2, we will give a normative theory, and in Section 3, we will explore theoretical and philosophical bases for practical management. In Section 4, we discuss required empirical research. In Section 5, we will give a brief discussion on practical management of the future earth.

2. Normative Theory for the Earth as Unity

The Entire Earth as Unity

There are about 200 sovereign nations in the present earth. It is an implication of the smallness and narrowness of the earth that those nations will no longer be able to retain their sovereignty in the near future. We will inevitably face some worldwide problems for which we should take the entire earth as unity. For example, when present nations face severe conflicts, or when a problem at the level of the entire earth happens such as global warming, we need to consider the integrated unity of the nations and people in the earth, which we call the *world nation*. By the world nation, we would not look for a utopia. The earth has many people and local regions: We should forget to the possibility of practical management of the entire earth solely by the world nation. If an event is serious either locally or globally and it cannot be resolved by local authorities, the world nation should intervene in the event. The world nation is simply the supreme authority to make a normative judgment for such an event[7].

Since many local and global events possibly occur in the present and future earth, the normative theory for the world nation 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

[7] This argument sounds related to "global justice" discussed in the field of philosophy of law. It has been discussed that developed countries are responsible to poverty in underdeveloped countries such as in Africa. The main issue in this field is to look for moral responsibilities of the advanced nations and their people. Many viewpoints have been discussed, but Rawls's [23] distributive justice relative to "global justice" is the central term (see Pogge [22]). We will discuss briefly the relation of Rawls to the normative theory given in this paper.

worldwide disaster in the near future due to the greenhouse effect and worldwide overpopulation. 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 choose the ultimate worst possibility for the entire earth and can discuss other events in the scope in a relativistic manner.

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 and narrow earth and the world nation. Nevertheless, the logic of his social-contract theory of a nation described in his "*Leviathan*" [9] can almost directly be extended into the social-contract theory of the world nation. In order to study the logical 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 (equivalently, everybody has no right to anything). 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, everybody gives up and provides almost all rights to the nation, and agrees a social contract to have the central authority for governing the nation[8]. We emphasize that this is not a historical origin/emergence of a nation but the logical one.

A point of Hobbes's logic is to treat individual rights directly as an important component of his social contract theory. This will be discussed with comparisons with Rawls' [23] logic in the end of this section.

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[8] Hobbes [9] 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.

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, if, even, 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 (of the earth) must have priority over any other objective**[9]**.**

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, of course, 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 earth and human race for Hobbes's state of nature. More explicitly, everybody has the power to destroy the entire earth by pushing the bottom of the last atomic bomb.

This sounds to be a crazy normative theory, but is a logically inevitable conclusion from the smallness and narrowness of the earth, the principle of the equal treatment of every human being, and the universal scope of the theory including all possible events in the future earth. Nevertheless, we should be conscious of the remark that this is a normative theory only used to evaluate a serious event happing in the earth but is not a positive theory for practical managements of the earth, which will be discussed in Section 3.

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[9] Einstein [5], p.146.

The theory can compare any serious events possibly occurring 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.

Abrogation of Vested Rights and Interests

First, we will see a conceptual implication of our normative theory to individual rights and duties. As we have combined the worst case of total destruction of the earth with Hobbes's logic, we have an implication categorically different from the present thought about rights and duties for an individual being. To understand implications of this extreme view, we start with comparing to free-market libertarianism.

Property rights are very basic for free-market libertarianism; ownerships for properties and, more basically, individual lives are protected by a law and police power from stealing, robbing and even killing. This legal and police power needs to be financed by a tax system, which is a partial denial of property rights; and they are necessary for free-market libertarianism to make sense.

We, living in "modern" societies, are apt to think that ownership of some property should belong to the owner, and further that each individual being should have integrity, meaning that his/her identity belongs to himself/herself. This is already an illusion in "modern" societies in that they need some social systems to protect ownerships and individual integrity, but many of us living in "modern" societies of the beginning of the 21st century have not experienced states without such protecting social systems. Similar false beliefs are held on "sovereignty" of a nation meaning that it retains vested rights and interests. Once a nation is in a war or beaten by another nation, individual integrity and nation's sovereignty are meaningless.

Consider individual integrity and a nation's sovereignty literally: Even though people in developed nations know that many people in Africa are waiting for death from famines, hungers, conflicts, wars, and genocides, the former people have no duties (no rights) and can (should) ignore it because they have their own sovereignty as the latter people do so: People's rights and integrities in Africa should be respected as those in the developed nations are so.

Some people may argue that their poverty should not be independent of economic activities in developed nations: A main cause for droughts and famines, which lead to racial conflicts and killing, in Africa is from economic activities in developed nations. Conventional thought is to find a line to divide causes between developed and African nations, and thus people in the developed nations should give some aids to the latter

people[10]. This gives only a temporal resolution, but an arbitrary line drawing is remaining. This is, more or less, in the same scope as the free-market libertarianism and its adjustment.

Very contrary to the fee-market libertarianism, in the Hobbes-Einstein social-contract theory for the world nation, no individual being can keep vested rights, and no nation can do, since everybody has a power to reject it by destroying the earth. Unless we go to this view, there remain some arbitrary lines between ownerships and charities. 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 belong 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 on the earth, and everybody has the right to the entire community.

We call this (**) the *principle of the world human community*. This principle denies and 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 (**); when we need the very basis of our normative principle, we should recall this 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 (some part of) their 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 normative theory for the world nation for the present and future

[10] Arguments of this type have been found in the field of global justice (see Pogge [22]).

earth. One mathematization of the above argument is the theory of the *Nash social welfare function* proposed in Kaneko-Nakamura [17]. It is given as

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

where $i = 1,..., n$ are the members of the world nation, u_i is the utility function of 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 to stop 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 [18]. 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 situation.

By associating the Nash bargaining theory of [20] with the Nash social welfare function, the feature of the social-contract of our normative theory becomes more explicit and is 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 his vested rights and interests since his attempt to keep them might lead to his nonexistence[11, 12].

Difficulties in Applications of the Principle of World Human Community

We have a lot of difficulties in practical applications of the principle of the world

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11 The above argument looks similar to some studies of contractarian-morality such as in Binmore [4], Gautier [6] in that agreement and bargaining is the fundamental components for morality. However, our normative theory is not to explore people's (natural) morality; this belongs to the subjects in Section 3, but we do not take this view.

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

human community or the Nash social welfare function to more general and less extreme 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. In this case, the physiological part of "utility" dominates the social/cultural part. In less extreme problems, however, "utility" is 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 red is the symbol color of their community. In this example, social-psychological part becomes dominant than physiological part, provided that physiological conditions do not much change. A utility loss by taking blue sweaters is incomparable with that of genocide or starvation. Psychological "utility" is not as important as death or lives, and even may not need to 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[13].

In the example of famines/hungers/genocides, direct and immediate actions are required. 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 societies. Therefore, social institutions and their management become the target of our study, which will be discussed in Sections 4 and 5 from different perspectives. With such studies, we may apply our normative theory when we need.

Right-Based Normative Theory

The reader might wonder why we do not adopt Rawls' [24] theory of distributive justice. This theory starts with focusing on and improving people in the worst state, which is formulated as the *difference principle*[14]. This has no further consideration of individual rights. On the other hand, our normative theory, as in the Hobbesian theory, is based on the hypothetical setting to eliminate the institutions protecting and controlling individual rights from every member of the world. This is the extreme case of right distribution. Thus, our theory is a right-based normative theory.

As already mentioned above and will be discussed in the later sections, the use of

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[13] In the literature of social choice and welfare, it was asked whether or not individual welfare (utility) is a right foundation for social welfare. Also, it is asked whether social decision processes should be taken into account. See Suzumura [26]. Here, we take the position that physiological individual welfare should be taken into account, but we evaluate as the outcome but not a process. A process is evaluated by its possible outcome, but a process itself has no values.

[14] Rawls [24] claims that his theory is supported by the argument called the *veil of ignorance*, which is interpreted as expressing a unanimity decision of the members of the community in question; in this sense, it is claimed that the theory is contractarian. However, the veil of ignorance argument is more coherent to Harsayi's [8] utilitarianism than Rawles [24], as far as we look at them from the viewpoint of the present utility theory.

social institutions will be inevitable for practical management of the earth. The central target of a design of a social institution is to control individual rights, within which each individual being is admitted to have freedom of behavior and thinking. It would be appropriate for the normative theory to be right-based; it evaluates a design of individual rights from the principle of the world human community (**).

3. Theoretical Studies of Humans and Societies

Here, we claim and argue that each of a majority of individual beings is effectively living in his local community and is unchanged or changing very slowly, even while he is surrounded by globalized economic activities. This claim implies a great difficulty in a practical management of the earth. We should scrutinize how we have this claim. This claim itself is not new, and found in some social sciences such as sociology and cultural anthropology. But we need a theoretical (mathematical) investigation of it in order to have a better understanding of the human world. The key theory is inductive game theory recently developed by the present author and his collaborators (e.g., Kaneko-Matsui [16], Kaneko-Kline [15])[15]. In this section, we explore the claim and its implications to the small and narrow earth.

Diversity of Customs, Behaviors, and Ways of Thinking

Some reader may doubt the above claim, since convenient and rapid technology will be available to everybody, with which he may communicate to more people in the local and global manners. We argue below that the social context surrounding him exceeds his cognitive ability, which is essential to our social worlds and remains unchanged. A change in information technology is limited to the superficial level: Communication device relies upon a language, and a language is too coarse to convey their deeper and detailed cultural backgrounds.

Here, we give a rough sketch of the basic idea of inductive game theory, which we will elaborate later, again: People cannot instantaneously adapt themselves to new situations. Situational knowledge is only obtained by putting themselves to new situations and having experiences there. No *a priori* knowledge on those situations is available to a new comer. The learning from experiences requires a lot of trials and errors; each time, a person may learn only small part of the local structure. To understand the local structure better, he needs to put deeply himself to the situation and experience the same situation many times. Those experiences are scattered over

[15] The basic research program of the author is described in [13]. More recently, Kaneko-Kline [15] has developed a new theory called *inductive game theory*. The skeleton of the theory is described in [13].

time, and he needs to recall them to construct a view on the situation.

These are all time consuming and constrained to local social environments. Slowness of individual changes is inevitable because a local social situation has some structure and a trial/error gives only some partial piece of it each time. To realize this point, the reader may reflect upon his social net work and how many people he can communicate to about his local community. This observation together with a large society has the implication that diversity of cultures, behaviors, and ways of thinking is inevitable even with rapid information technology.

Diversity of cultures was emphasized by Benedict [3], a cultural anthropologist, by observing many advanced and primitive societies: She was strongly against the biological-environmental determinism of human cultures that natural, biological and environmental components determine people's behavior and thinking. To confirm and develop this view of diversity, we need more theoretical study of it, which is discussed below.

Our view is very different from the standard economics and game theory. Logically, these theories are neutral or silent about diversity and cultural differences in people. However, they have a tendency to deny such deeper cultural backgrounds and diversity of them, since they have no such diversity in their scopes.

The Cognizance Assumption in the Standard Theories

In the standard economics and game theory, it is typically and implicitly assumed that an individual agent has well-formed beliefs over the structure of the model; "a belief" is often expressed as subjective probability in the sense of Savage [24]. This needs the underlying *cognizance assumption* that the structure of the target situation (model) is *a priori* known to each agent: Otherwise, a probability measure defined does not make sense. The term "uncertain" which is often used as synonymous to "unknown" means that some estimated probability is less than 1, or more generally, there are multiple possibilities for given information. But it is the cognizance assumption that the set of possibilities is *a priori* known to an agent. This is discussed while after explaining inductive game theory.

Inductive Game Theory: Exploring Experiential Sources of Beliefs/Knowledge

Instead of starting with the above cognizance assumption, inductive game theory explores the origin/emergence of beliefs/knowledge of the basic structure in individual experiences[16]. This changes our understanding of the social world by almost 180°

[16] Here, the concepts of "belief" and/or "knowledge" are entirely different from those in the sense of subjective

degree: We would find the implication that we need the social scientific, theoretical and empirical, research in many ways.

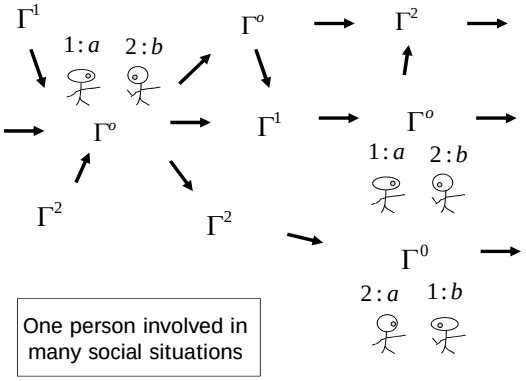

Figure 3.1

Each person is involved in various social situations of the social-web; family affairs, school, offices, friends etc. In Figure 3.1, each of $\Gamma^o, \Gamma^1, \ldots$ is a social situation which may or may not involve him. The social-web is already very complex for him, and only some very small part relative to the entire social-web is related to him; the other parts are invisible to him. He follows some behavioral patterns in those situations. He has no *a priori* knowledge of the structure of each situation involving him. Only after experiencing one situation several times, he may have a view about the target situation. Then he may choose a better alternative action using his understanding of the situation. If a situation is the first time for him or if he has little understanding of the situation, he can choose only a *default action,* predetermined in some manner such as labeled "first".

Once this viewpoint is taken, we will notice that the cognizance assumption for each agent is highly problematic. For example, let Γ^o be the 2-person extensive game described in the left of Figure 3.2, which is described from the objective point of view: On the contrary, we make the basic assumption for individual persons that neither of persons PL1 and PL2 knows the structure of the game. For the sake of clarity, let us make one working assumption, here, that person PL1 does not know even the existence of person PL2 moving after person PL1. The second ignorance assumption is often observed in larger games, while a pure 2-person game may appear funny, but this is for simplification for the argument here.

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probability. It is about a symbolic sentence or symbolic structure. "Knowledge" is a true "belief", where truth is defined outside. See Kaneko [12], Section 6.

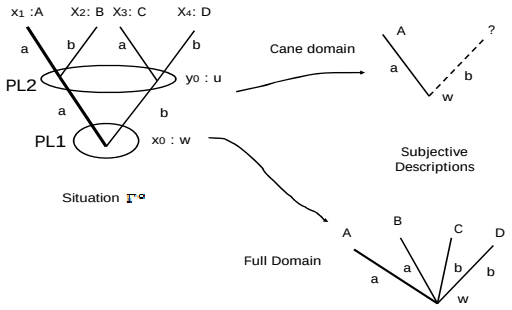

Figure 3.2

If both PL1 and PL2 have always been playing act *a*, PL1's experiences of this situation give a view like the upper right tree having the outcome *A*, but he recognizes another available action *b* without knowing the outcome from it since he has never experienced it. If each of PL1 and PL2 has tried both actions, then PL1 has experienced the four outcomes which have been led by his two actions. Here, we still assume that PL1 does not know the existence of PL2. Then, his view on this situation becomes like the below right tree: Each of PL1's action may result in two possible outcomes, e.g., *A* or *B* results by choice *a*. Changing the assumptions on trials and accumulated experiences, we have more possible individual views.

There is a great variety of such individual views possibly generated from experiences. The game we have considered is extremely simple; yet we meet such multiplicity of individual views. For a game with larger action sets and more people, the number of possibilities becomes quickly astronomical. Recall that one society consists of a huge and complex social-web. People belonging to different parts of the social-web have developed their own views. Thus, there are many possible individual views for people the social-web.

The computerized technology does not help very much each person to learn details of social situations. This constraint will not be eliminated by progress in technology, since complexity involved is simply astronomical and will not be caught by computer technology in the near future.

Theoretically speaking, we can study how such diversity has originated and emerged. However, with the theory, it would be difficult to find which particular forms of cultures happen more likely; the theory can talk about the structure but may not find detailed patterns in diversity. S To see possible and detailed patterns in diversity of cultures, we need to look at real worlds and empirical research is required. Such studies should compensate for the theory, which will be discussed in Section 4.

Underlying Model of a Human Being: Conservative Nature

An individual person typically follows his behavior pattern and only occasionally makes deviations from his behavior pattern. In addition, a person has also a patterned way of thinking. These are because making trial and error is behaviorally and mentally costly. In a social context, in addition to his own trial and error, he may have learned patterned behavior and patterned thinking from other people from his childhood.

The underlying model of a human being in inductive game theory is such a pattern-governed person, but only occasionally, he thinks about new possibilities. In economics term, new trials are scarce at the behavioral and mental level for each individual being. This implies that a human is necessarily conservative for his present situation and thought. If we take such a component, the description of society in inductive game theory becomes more conservative. This gives a clear distinction from the standard economics and game theory, which will be discussed now.

Cognizance Assumption in the Standard Economics and Game Theory

As already stated, in the present standard economics and game theory, an individual agent is assumed to have well-formed beliefs over the structure of the model, which needs the cognizance assumption. This has various derivative aspects. For example, utility maximization is regarded as an important component of the standard economics and game theory. The cognizance assumption is a sufficient condition for utility maximization, but it is additionally assumed that utility maximization is instantaneously made; the researcher often forgets how utility maximization reaches a maximizing point.

A related aspect is the overuse of set-theoretical expressions: All symbolic propositional expressions are represented by sets of possibilities. This needs also the cognizance assumption on (a full understanding of) the underlying structure: For example, the concept of information is expressed as a set of alternative possibilities[17]. This is also a base for an instantaneous utility maximization.

A utility maximization is an existential statement comparing all other possible alternatives. To identify such all alternatives is not a simple task and to find such utility maximizing point need some or long time. These are all time- and energy-consuming processes for a person, but are ignored in the standard economics and game theory: Each agent has no problems to manage all possible alternatives and to find a maximizing point.

[17] In real world, information must come to a person as a language (symbolic) expression. The set-theoretical expression of such a langue (symbolic) expression is a presumption for the standard economics and game theory.

In the scope of the standard economics and game theory, we do not find diversity of background cultures of people. The cognizance assumption makes this problem trivial. Following these theories, people may have different utility functions and have some difficulties to reach an agreement. However, people from different cultures may have different understanding of societies, values, and even different ways of thinking. They may never reach an agreement in the sense of the standard economics and game theory.

Necessity of Methodological/Philosophical Studies

Here, we mention necessity of methodological (/philosophical) studies of our research itself. As we need a normative theory to discuss objectives and evaluations, methodological considerations are necessary to direct theoretical and empirical research: Without such bases, theoretical research could become mere mathematical generalizations, and empirical research might be simple pursuits of social incidents.

In "*Nineteen Eighty-Four*", Orwell [21] wrote about a new system of language called the "new speak" forced upon people. Behind new speak was the philosophical idea that if some words were removed from the dictionary, the concepts described by them would also be eliminated. For example, if the word "revolution" were removed from the dictionary, then people might no longer be able to conceive of a revolution, and revolutions would cease to occur. This metaphor 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".

Radical or Mediocre Theories

Arrow's impossibility theorem is regarded as an important theorem in welfare economics, claiming 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 of society to the mechanism. We find a difficulty in this interpretation in that "having a preference relation" should be distinguished from "knowing his own preference relation". The former is not conceptually problematic; only some technical problems may exist. On the other hand, the latter is profoundly problematic: How does one know his own preference relation? If the number of alternatives is two or three, it would not be problematic, but in the case with many alternatives, it is painful for his to think about his own preference relations. This is compared with a statement about one's brain: It is unavoidable to assume that a person has a brain but cannot know its inner functioning. The real problem is not to aggregate preferences with no such distinction,

but is to study the underlying structures of individual preferences.

Another example is free use of "probability" and/or "subjective probability". People's beliefs are expressed by "subjective probability" by Savage [25]. In the theory of games with incomplete information from Harsanyi [9], it is extensively used expressing beliefs about nature as well as other's beliefs, and also, being interpreted as logical inferences. Savage [25] gave an axiomatization of "subjective probability". But any "axiomatization" is not beyond necessary and sufficient conditions: Unless some premathematical argument or evaluation about the suitability of those conditions is given, the axiomatization is meaningless. In the case of "subjective probability", the real problem is where and how such a probability comes from[18]. The use of such beliefs expressing logical inferences is just coming from ignoring the other field of mathematical logic, which has a long history from the ancient Greece as a scientific study of human logical inferences.

The above are examples of existing theories regarded as important but shut down their eyes from the real problems underlying below their theories. Using Orwell's metaphor, the concept of an "underlying" structure is missing. Although the initiators of those theories dig new problems at their times, now these theories are graded as mediocre. According to Kuhn [19], a history of science has a long steady period of progress generating variants within one paradigm and has a possible scientific revolution only when serious anomalies appear.

However, the earth and human race are urgent; we cannot wait for a long period before a revolution in our sciences. Instead, we should be conscious about what an important problem is and what a mediocre one is. We should radically attack the very heart of each problem, at least trying to avoid any mediocrity.

4. Empirical Studies of Societies and Social Institutions

The human world continues to have great diversity of cultures, and in the future earth, people of different backgrounds meet each other more, which almost inevitably causes serious conflicts between those people. Such a background is deeply impregnate in each community, and cannot be easily erased by teaching a common language such as English and/or computer technology. Although inductive game theory gives some hints to understand human societies and their diversity, it is, so far, an abstract theory and needs empirical research on social worlds. In this section, we will discuss what kind of

[18] 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 [27]. For expected utility theory, von Neumann-Morgenstern [30], Chap.1 explicitly stated that they adopt the frequentist interpretation. See Hu [11] for an explicit treatment of expected utility theory from the frequentist perspective.

research is required to understand such diversified cultures.

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 empirical research for these questions: The horizontal research is to study what is happening over the present earth, and the vertical one is to study what have happened in the past of each region. To consider the future world, we need, at least, these two different methods.

From the horizontal viewpoint, we see great variety of human cultures as well as events happening now in the world such as desertification, poverties, famines, hungers, spreads of diseases, conflicts, and genocides occurring in African and Asian regions. To study people and their behaviors in such extreme situations helps our understanding of human beings and societies. On the other hand, from the vertical point of view, we trace events in the past of a region and understand what social structures and social institutions lead to some incidents. By those studies, we may have some predictions on possible incidences in the future earth and find some ways to prevent from or ease them.

Historical Investigations of Japanese Societies

In the book [13], the present author adopted the vertical methodology to look into Japanese histories of 400 years. Although Japan is a geologically small country, its histories give hints to consider the future earth and possibility of the world nation: The modern Japan started in 1868, and before it, Japan was governed by the Tokugawa family, a feudal clan, for the period from 1603 to 1867: During this period, Japan had the policy of national isolation from 1633 until 1858, except for a small channel (a small island in Kyushu) to the Netherlands. After 1868, Japan was quickly industrialized, and took the militarism until the end of World War II. Then, it has grown and become one of the richest nations in the world.

Looking into Japanese societies in the past, we find some social situations hardly perceivable in the present Japan. For example, extreme poverty prevailed in the rural areas in the Tohoku region in Japan from the Tokugawa period until some years after the end of World War II[19]. This is just one aspect relevant to our considerations. In the following, we mention only some observations about Japanese histories.

[19] Tohoku is the north east area of the main island of Japan.

Concentration of Land Ownerships and its Implications

In the Japanese histories of 400 years, we find that private ownership, which is one of crucial target issues as already discussed, created a small number of huge landlords and a large number of peasants: This was found in the Tokugawa era, but after the reform of the tax system on farm lands in 1873 (6 year after the Meiji restoration (1868)), the percentage of peasants in the Tohoku region had increased from 15%~20% to 45% ~ 50% in 40 years later. Suffering cold weather for several years, many peasants in despair sold their daughters for prostitution in Tokyo. The concentration of land ownership was only fully dissolved by the allied powers after World War II. In fact, this concentration of land ownerships and political dissolution were repeated from the civilization in Japan (about 7^{th} ~ 8^{th} century).

The market system with the specific legal structure led to the above mentioned concentration of land ownerships. As discussed in Section 1, the central assumption for the market system is property rights (private ownerships), which needs a legal protection. For the practical management of the future earth, it could be inevitable to use a market system in a certain manner, which requires us to admit property rights. However, we should always be careful of controlling the system of property rights. Our normative theory given in Section 2 gives a basis for this consideration.

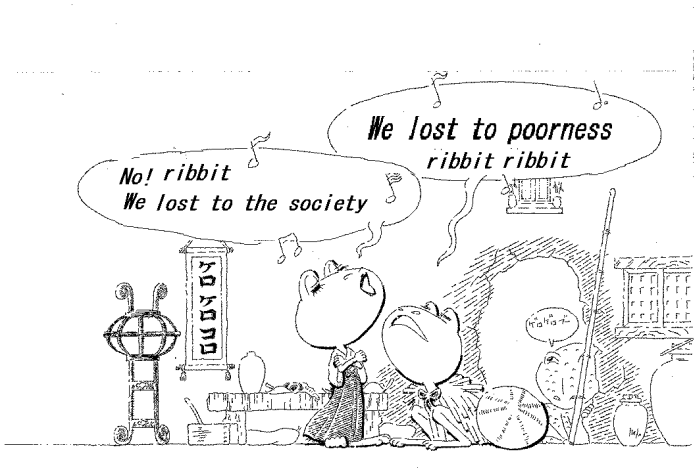

Figure 4.1

Conservativeness and its Implications

The concentration of land ownerships is an external phenomenon. If we scrutinize into landlords' behavior and words, we are able to find very conservative nature of their internal mentality: They were apt to think that their ownerships would be eternal; their justification often took the following form: Their furthest ancestors reclaimed

wastelands by hard work and all successors had kept their land from generations to generations. Some bought lands from (small) farmers by paying some amounts of money, but they were all legally legitimate.

We call this kind justification for their present situation *rationalization*. A rationalization is one explanation among many other possible ones. This is consistent with what we discussed in Section 3: There is a great multiplicity in possible individual view derived from a player's experiences. With such multiplicity, we have a tendency to find one favorite explanation (see kaneko-Matsui [15] for more discussions on this). It is also important to notice that such an explanation is often not objectively faithful and relies only upon some part of the reality. This is the conservative nature of a human being.

Rationalization can be observed in everybody in the world. It is inevitable by our patterned behavior and thinking. Regarding the present situation as eternal is quite universal. This gives implications to "Abrogation of Vested Rights and Interests" discussed in Section 2 and "Conservative Nature of a Human Being" in Section 3. From the normative theoretical point of view, we should abrogate vested rights and interests, but in reality, people naturally want to keep them; they are conservative, regardless of being conscious or unconscious. Therefore, the principle of the world human community, denying them entirely, is needed to make us conscious of our conservative nature.

Administrative Units in the Past

We should mention one important fact in the Japanese histories having relevance to considerations of the future earth.

Before 1868, Japan was divided into more than 300 feudal states, and people were not able to across freely the boarders between those states. Poor people such as farmers were strongly restrained to stay in their local places, and their views were limited to their places. It was one consequence that each state developed its dialect. After the Meiji restoration, Japan became one nation without legal boundaries, but people from different states had difficulties to communicate. This was true until recently between people even from next states, but now young people, due to the TV, speak the standard Tokyo dialect. This fact may tell that diversity may be getting smaller in Japan. Nevertheless, the author, born and grown in Tokyo, lives now in 60km in the north-east from Tokyo, and has been experiencing difficulties in talking to local old people with strong dialects in our area.

One important fact above is that the number of feudal states in 140 years ago was more than 300. Before 1868, the scope of each person was typically restricted to his

small state. But now, nobody thinks that each feudal state is his country. This change has happened only in 140 years[20]. But it is unclear that diversity of people is getting smaller or remaining unchanged at least at a non-superficial level.

5. Management of the Future Earth

Social Institutions of Various Degrees

In Sections 1 and 2, we discussed the necessity of the world nation for the future earth. In Sections 3 and 4, it was discussed that the earth is and will remain fulfilled with diversified cultures. It is an important point that each individual being has a small social world. Nevertheless, each individual being is connected to larger societies in various ways from his family, schools, companies, towns, prefectures, and nations through social institutions and legal structures. These are devices for division of labor and guarantee that people are connected. Without those institutions, we could not keep our present societies, economic activities, and people's welfare. In 2,400 years ago, Plato [22] already discussed the needs of social institutions to run a nation in a quite comprehensive manner.

Social institutions are connected in complicated manners; some are hierarchically connected; some are in nesting, exclusive, or inclusive manners. For example, a private company, which is a relatively small social institution, can take economic activities under the protections of local or central governments, which are larger social institution, provided that the company pays legitimate taxes and can behave freely under given legal constraints.

The above description has nothing essentially different from the present world with many nations. However, when a worldwide disasters happens, or when some very bad events happen in some places in the earth, sovereignty of each nation should no longer be kept; and the world nation should play roles of stopping and/or coordinating. To control worldwide problems such as global warming, over-population, etc., we would meet a difficult coordination problem between the individual economic activity level and worldwide global level.

One possibility is to jump to the control of all detailed activities of local community or even every individual person. This is, more or less, the communist planning economy, where the central planner makes all detailed production plans. The failure of this idea

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[20] Another striking fact is that the total population in Japan did not grow for the period of the Tokugawa era. It grew from 1600 to 1700, but after it, the total population declined for many years, and only at the end of the Tokugawa era, the total population was rebounded to reach the same level as that of 1700. This fact was not caused by a high rate of infant mortality; the birth rate itself was law during the period from 1700 to 1867. After the Meiji restoration, the birth rate became very high. Some demographic anthropologists have worked but did not give a good explanation for such decline of population.

was historically shown by communist nations up to 1990. Theoretically, once great diversity of cultures discussed in Section 3 is recognized, this failure could be logically clear. Therefore, some decentralized managements of the social economies are inevitable. Again, we meet the use of market systems. But as already discussed, we cannot go to free-market libertarianism. Now, we can say only that a restrictive use of a market system is aimed for practical management, but how to be restrictive must be our future study.

Larger Administrative Units: Contradictory Features

As stated in Section 4, until 140 years ago, the Tokugawa family acted as the central government but Japan remained divided into more than 300 feudal countries ruled as administrative units by feudal clans. In the present European Union, the borders are practically removed, and people can move freely in search of a job from one nation to any other nation within the Union. In the year 2100, the concept of a "nation" will be less clear-cut in the European Union.

The above description of the historical direction may be interpreted as meaning that unification of present nations to a certain degree could be a natural conclusion. Also, some centralized management would be needed, but it is 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. On the other hand, we have discussed also that due to diversified societies, decentralization of economic management is inevitable. Thus, we have a lot of contradictory features for practical management of the entire earth. We should study how to reconcile the centralized idea of the world nation with practical decentralization.

6. Summary and Conclusions

In this article, we considered various problems expected for a small and narrow earth of the future earth. Our discourse consisted of two almost contradictory parts: a normative theory and a descriptive theory: The former is to provide, viewing the earth and human community as unity, evaluations of possible events and of designs of social institutions. The latter, discussed as social sciences for practical management of the earth, states that great diversity of cultures will remain, which implies that a unified management of the earth is practically impossible. Nevertheless, without the normative theory, we would not be able to think about where the earth should go.

The latter requires us to do a lot of social and empirical studies in comprehensive manners. In particular, we discussed inductive game theory, but it is still premature

and needs to be developed in many ways. Also, for a historical study, we looked briefly at the Japanese societies of past 400 years. It gave a dynamical change of the social structure of Japan, and perhaps a similar change could be observed in the history of other nations. This may give a lot of hints for further considerations of the future earth. In this article, however, we have not discussed geological differences as well as similarities in the world. Such differences should be considered both empirically and theoretically. To make a meaningful practical recommendation, we need to understand the world well, and better understanding needs philosophical, theoretical and empirical studies.

The future of the earth appears hopeless, but we, social scientists as well as other scientists, should now very seriously investigate the problems of the future earth. This should include technical studies of the external worlds, people's internal mental worlds, normative studies, and philosophical studies of researchers' methods and their attitudes. We are also required to synthesize studies of different fields; in the present academia, various fields on close subjects exist almost separately. Those scientists should cooperate to save the earth and human beings. As our task is extremely urgent, we should take a truly radical attitude for every step and avoid falling into any sort of mediocrity.

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