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Extension of Utility and Its Application to Economic Development : A Hypothesis for the Cause of the Failure of Foreign Aid

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Abstract: In this paper, we start with a recognition that economic decision making is achieved not independently but as a part of general decision making in an everyday life. We extend a usual utility concept used in economics to obtain a broad sense of utility named comprehensive utility. By using this utility, we make up a decision making model for a representative individual in which a unique concept of energy is devised to complete our system. The model combines economic and other behaviors of an individual in the society, which allows us to turn to the problem of the failure of foreign aid in economic development. Focusing on incentives of people of a country, we show that a specific measure, marginal rate of substitution between two kinds of utility in the comprehensive utility, for a representative individual plays a significant role in the failure of foreign aid.

I . Introduction

In recent years, the standard economic theory has been subject to criticisms of various kinds. Among others, a consumer's choice behavior based on its utility maximization has been considered suspicious from a practical viewpoint and reexamined by many researchers specialized in experimental science or psychology. Actually, behavioral economics and experimental economics have mostly focused on this issue.

It is pointed out in many literature that a consumer, when making a decision, not only thinks of its utility maximization but also takes into account other factors. That assertion is plausible from a practical viewpoint. However, the problem is how to incorporate those factors into a decision making process to gain a consistent theory substitutable for the existing one. This is a very difficult job and it has not successfully conducted so far.

In this paper, we try to deal with this problem by extending a utility function. We take a broader view so that we can include cultural factors. However, instead we have to abandon consideration of psychological tendencies peculiar to consumption activities like 'anchor effect'.

Our approach starts with consideration of utility of our everyday life in a broader sense. In economics, they only think of utility that is derived from consumption of goods and

services whether it is private or public. We, however, have many things which cannot be evaluated by a price but induce utility for us. We include all those things as well as goods and services to make up comprehensive utility that is supposed to play a crucial role in our decision making in everyday life.

Economic utility that is derived by goods and services mainly depends on materials. On the other hand, there exists another utility that is based on mentality, which does not allow any price-evaluation. We categorize the sources of such mentality into two groups; namely human relationships and natural amenities. Thus, we consider that there exists three kinds of utility combination of which leads to comprehensive utility, which is thought of as an ultimate criteria for a decision making. Let u_g be utility caused by materials, u_h be one caused by human relationships, and u_n be one caused by natural amenities. Then, the comprehensive utility can be expressed by $U(u_g,u_h,u_n)$.

It is worth noting that each source of utility has its own background. For goods and services, it is a certain level of production process. For human relationships, it is a social framework made up by culture, institution, manners and customs, social norm, conventional wisdom and so on. And for natural amenities, it is nothing but a state of nature. In analyzing a decision making, these are assumed to be given.

A characteristic of our argument is to apply the optimization concept familiar in economics to this comprehensive utility U. In this sense, we inherit the basic idea of economics. However, in order to complete our system we need something which combines three independent factors making up comprehensive utility. As such a device, we use a concept of energy that is inspired by thermodynamics. We assume that human energy is given for an individual, being used for various activities which enhance U through the three kinds of utility above mentioned. Then, we can transform the above decision making problem to an allocation of energy problem in which U is maximized subject to a given total level of energy. A solution to this problem leads to optimal level of consumption and production. It turns out that a solution is crucially dependent on the marginal rate of substitution between two kinds of utility (denoted by MRS_u) in U.

Many applications of this approach are conceivable. Among others, we pay attention to an application to economic development, in particular, the problem of failure of foreign aid. There is a vast number of literatures dealing with this issue. Many researchers have mentioned many reasons for the failure of foreign aid, which can broadly be divided into two groups. One is about the character of aid itself, and the other is about internal conditions of recipient countries. For instance, problems of aid proliferation and tied aid belong to the former while lack of a social infrastructure and ineffectiveness of an aid agency belong to the latter. These explanations are probably more or less right, but we

take a different angle to contribute to the issue.

Needless to say, not all developing countries have suffered from the failure of foreign aid. Some have succeeded in economic development through aids, others have failed. We attribute this deference to a kind of endogenous incentive to develop in a country concerned. More specifically, that incentive is characterized by the above MRS_u. Given a special condition of production process in a developing country, we show that if MRS_u is low for a representative individual of a country concerned, foreign aid induces economic development of the country while if MRS_u is high, foreign aid is more likely to fail to do so. Our approach also has an explanatory power to the reality. For instance, we often observe that a big project set up with assistance of donors is thereafter left unused in a developing country. This phenomenon is rationally explained by our theory.

In section Ⅱ, we introduce an extension of utility and its maximization, which makes up our starting point. Then, in section Ⅲ, we refer to a unique concept of energy that is needed to make our system complete. We explain in the next section Ⅳ how the extended utility (called comprehensive utility) is used to obtain an optimal decision making. Section Ⅴ is devoted to the application of our comprehensive utility to economic development, in particular, the failure of foreign aid. After the historical view of foreign aid and a simple survey of the literature, we applies our argument to the matter in question, deriving some propositions and hypothesis about that. In conclusion, we summarize our whole argument and stress on the merit of our analysis with remaining issues.

Ⅱ. Extension of utility

In economics, a representative consumer is supposed to pursue maximization of utility that is obtainable through consumption of goods and services. However, some behaviors theoretically induced along this line are known to be inconsistent with real observations. Actually, many counter examples have been reported by researchers in behavioral economics and psychological economics. It may be safely said that a consumption behavior is influenced by other factors than the utility optimization. This view is intuitively understandable. On the other hand, it seems that those critics against inadequacies of the standard consumption theory have not succeeded in providing a substitutable theory for it.

In the literature of behavioral economics and psychological economics, they mainly focus on consumers' psychology that disturbs consumption behavior predicted in the standard economic theory; the anchor effect is its typical example. In this paper, we have

a totally different angle toward the problem. Our view is that every decision making including consumption is conducted through adjustment of various kinds of utility each of which has its own source. For instance, we will refrain from smoking before an intimate friend who dislikes tobacco smoke. We interpret this situation as follows. We like smoking because it yields a certain utility while we cherish our friendship because keeping it gives us a different kind of utility than smoking. When we face consumption of a cigarette, we think of not only a utility gained by smoking but also another utility provided by a friendship, leading to a final decision making.

Our view is formalized as follows. We take a representative individual and consider its behavior. In its everyday life, it gains various kinds of utility. According to their causes, we are allowed to separate them into two groups; namely one consists of utility obtainable through means that is evaluable by a price (or at least a kind of price) and the other includes utility depending on means unevaluable by a price (or at least extremely hard to evaluate by a price). The former is mainly induced by materials while the latter is solely caused by mentality. Needless to say, the former is just the subject of the standard economics, leading to a usual utility function. On the other hand, the latter can further be divided into two genres according to their sources. One is derived by an intensity of human relationships and the other is induced by amenities of nature.

Thus, we consider that there exists three kinds of utility combination of which leads to comprehensive utility, which is thought of as an ultimate criteria for a decision making. Let u_g be utility caused by materials, u_h be one caused by human relationships, and u_n be one caused by natural amenities. Then, the comprehensive utility can be expressed by $U(u_g,u_h,u_n)$.

It is worth noting that each source of the above utility has its own background. For goods and services, it is a certain level of production process. For human relationships, it is a social framework made up by culture, institution, manners and customs, social norm, conventional wisdom and so on. And for natural amenities, it is nothing but a state of nature. In analyzing a decision making, these are assumed to be given.

Facing a decision making for consumption, a representative individual is considered to use this comprehensive utility.

Hypothesis 1

A representative individual makes a decision for consumption through maximization of the comprehensive utility U.

Given these relations, we are allowed to depict the following diagram showing the

process that leads to a decision making.

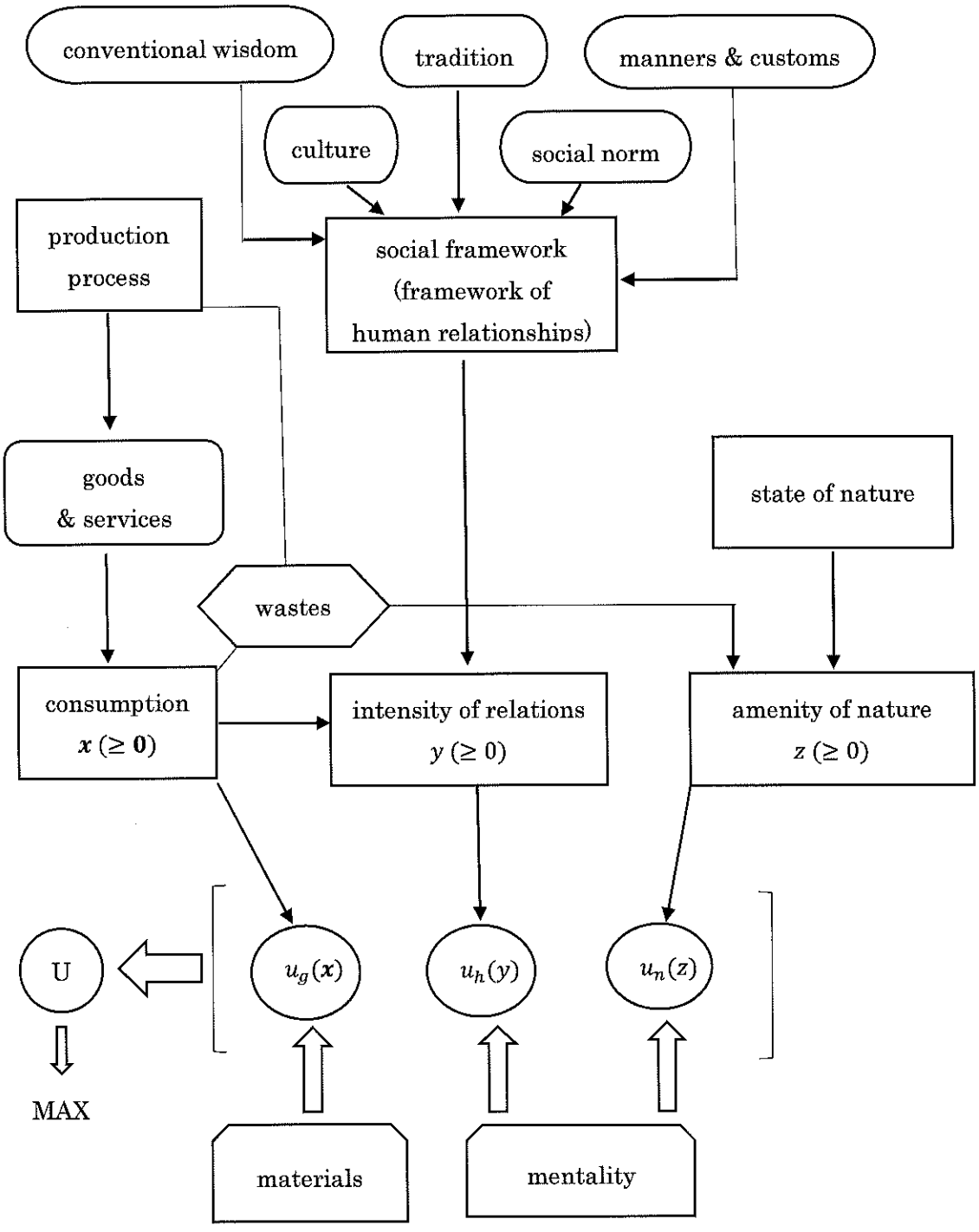

Fig. 1

Let x be a vector of goods and services, y be an index showing an intensity of relations,

and z be an index of natural amenities. Then, the decision making problem for consumption of a representative individual is described as follows.

$$\text{Max } U(u_g(\boldsymbol{x}), u_h(y), u_n(z))$$

It is worth noting that there are some relations between, y, and z. A consumption $\boldsymbol{x}$ is originally for the individual itself, but it is likely to affect an intensity of human relationship as well. In addition, $\boldsymbol{x}$ has some bad influences on amenities of nature through wastes it produces.

So far, our argument is not self-contained, thus it is impossible to gain a specific assertion about a decision making. We need identification of endogenous and exogenous variables and specific constraints on them to derive a meaningful proposition. To this end, we take a unique approach that is very different from our usual economic reasoning.

Ⅲ. Application of fundamental ideas of thermodynamics

Thermodynamics has, in a sense, a similar structure to economics. On one hand, it deals with a certain volume of gas and studies its thermo-phenomena like temperature, pressure, and volume through operation of heat and work, which corresponds to macroeconomics. On the other hand, it focus on behaviors of a molecule in a gas and studies thermo-phenomena of a gas through molecules' aggregate behavior, which corresponds to microeconomics. Incidentally, the latter is particularly named statistical (thermo) dynamics.

What we are going to use here is the latter. However, we do not use any advanced theory in the field. Instead, we only rely on its very fundamental idea. In statistical thermodynamics, a molecule is supposed to move at random. A fact that a molecule is moving is crucially important because it is considered to be a proof of a molecule's having energy (kinetic energy) in a sense of mechanics, which provides a basis for theoretical reasoning in statistical thermodynamics.

It is easily seen that a molecule corresponds to an individual while a gas corresponds to a society including it. Thus, we are allowed to analogically apply the above argument and consider an individual to have its own energy. The only problem is what corresponds to movement of a molecule (individual). We interpret it as all kinds of activities. We regard activities of an individual as a proof of its having energy.

A gas includes a huge number of molecules, which implies that molecules often collide with each other. When a molecule collides with another one, it changes its speed, which leads to a change in its level of kinetic energy. This is a standard view of thermodynamics. However, here we depart from the discipline and pose a following hypothesis.

Hypothesis 2

An individual keeps a certain level of energy through consumption of goods and services.

To put it another way, a level of energy is given for an individual as long as it survives. Let $\bar{e}$ be a given level of energy for a representative individual.

Now, let's turn to activities of an individual. When considering them, we should note that a molecule unconsciously moves whereas an individual consciously acts. It follows that an individual should allocate its energy to activities in its own way. In order to see how it does, it is effective to consider activities in terms of their characters. We can first divide them between life supporting activities and others. As for the latter, we assume the following.

Assumption 1

All activities but life supporting ones are just for enhancement of utility.

About this assumption, it is worth noting that we premise a society where people are guaranteed civil liberties.

Let $\tilde{e}$ be a part of energy devoted to these activities, which may be considered to be given. Since we have classified utility into three categories, $\tilde{e}$ is also divided correspondingly to the classification. Let e_g , e_h, and e_n be those components corresponding to u_g,u_h, and u_n respectively. Now that we have gained a missing ring to make our system complete, we proceed to analyze a decision making of a representative individual.

IV. Decision making process

Before arguing a decision making, we need to consider the relations between e_i and u_i $(i = g, h, n)$. Given that consumption is only possible after production of goods and services, we may consider e_g to be directed to production activities. What these activities produce leads to u_g. Next, e_h related to u_h is obviously devoted to activities that influence an intensity of human relationships. Then, e_n is clearly directed to activities that have a positive impact on amenities of nature, where we interpret a positive impact as preventing a bad influence of wastes. In summary, we have a following diagram showing an allocation of energy.

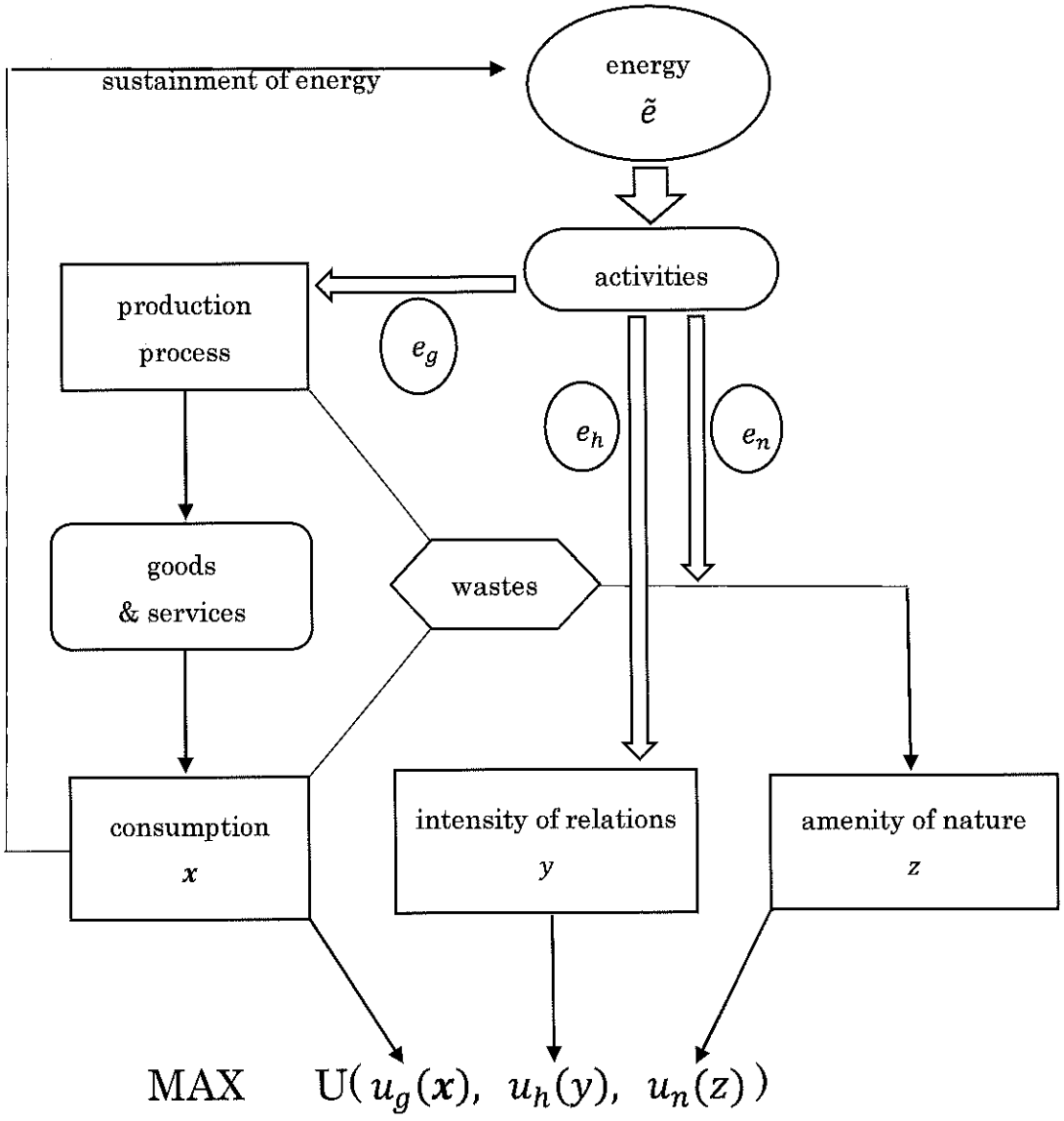

Fig. 2

Now then, we turn to an analysis of a decision making. In what follows, we focus on a mathematical exposition. In order to make our core idea easily understandable, we start with a simplified situation.

Ⅳ. 1. One family economy

There is only one family in a society, thus an individual is identified with the family. It is worth noting that the family is both a consumer and a producer in this case. In addition, we assume that x is aggregated to one product x for simplicity. Then we can formalize

an effect of each component energy as follows.

(1) e_g and its effect

$x = g(e_g)$: production process

$w_1 = w_1(e_g)$: wastes by production

$w_2 = w_2(x)$: wastes by consumption

$u_g = u_g(x)$: utility by x

where $g(e_g)$ may be regarded as a kind of production function. It is worth noting that its productivity (i.e., a marginal product and an average product) is dependent on the social infrastructure as well as the level of technology that are given. In the following, we define total wastes as $w = w(e_g)$, which is nothing but $w_1(e_g) + w_2(g(e_g))$.

(2) e_h and its effect

$y = y(e_h)$: influence of e_h on y

$u_h = u_h(y)$: utility by y

where we do not take into account an effect of x on y because its effect can be both positive and negative, so it is too hard to identify a certain relation.

(3) e_n and its effect

$z = z(w - e_n)$: influence of wastes alleviated by e_n on z

$u_n = u_n(z)$: utility by z

where z is a strictly decreasing function, thus set $z(0) = \bar{z}\ (> 0)$.

On the basis of these formulas, we can express the comprehensive utility as follows.

$$U = U(u_g(g(e_g)), u_h(y(e_h)), u_n(z(w(e_g) - e_n)))$$

Given hypothesis 2 and assumption 1, a decision making problem in question can be transformed to an allocation problem of energy that is formulated as the following optimization problem under a constraint.

$$\text{Max} \quad U = U(u_g(g(e_g)), u_h(y(e_h)), u_n(z(w(e_g) - e_n)))$$
$$\text{s.t.} \quad e_g + e_h + e_n = \tilde{e}$$

Before examining a solution of this problem, we need to establish properties of relevant functions. On the basis of economic conventions and conventional wisdoms, we may assume the following properties about them.

$u_g(x)$, $u_h(y)$, $u_n(z)$, $g(e_g)$, $y(e_h)$: increasing, strictly concave

$w(e_g)$: increasing

$U(u_g, u_h, u_n)$: increasing, quasi-concave

In the following, we dare to discard wastes and its effect, which also implies that we dispense with u_n. The reason for this treatment will become clear later in our argument.

Thus, all we have to consider is the following problem.

$$\text{Max} \quad U = U(u_g(g(e_g)), u_h(y(e_h)))$$

$$\text{s.t.} \quad e_g + e_h = \tilde{e}$$

To facilitate our analysis, we assume that all relevant functions are differentiable. Then, through simple calculations, we have the sufficient and necessary condition for a solution, which is as follows.

$$\frac{\frac{\partial U}{\partial u_h}}{\frac{\partial U}{\partial u_g}} = \frac{\frac{du_g}{dx}\frac{dx}{de_g}}{\frac{du_h}{dy}\frac{dy}{de_h}} \qquad \cdots\cdots (1)$$

By the properties of functions we have assumed, we are guaranteed a unique solution for which we can depict a diagrammatic exposition below.

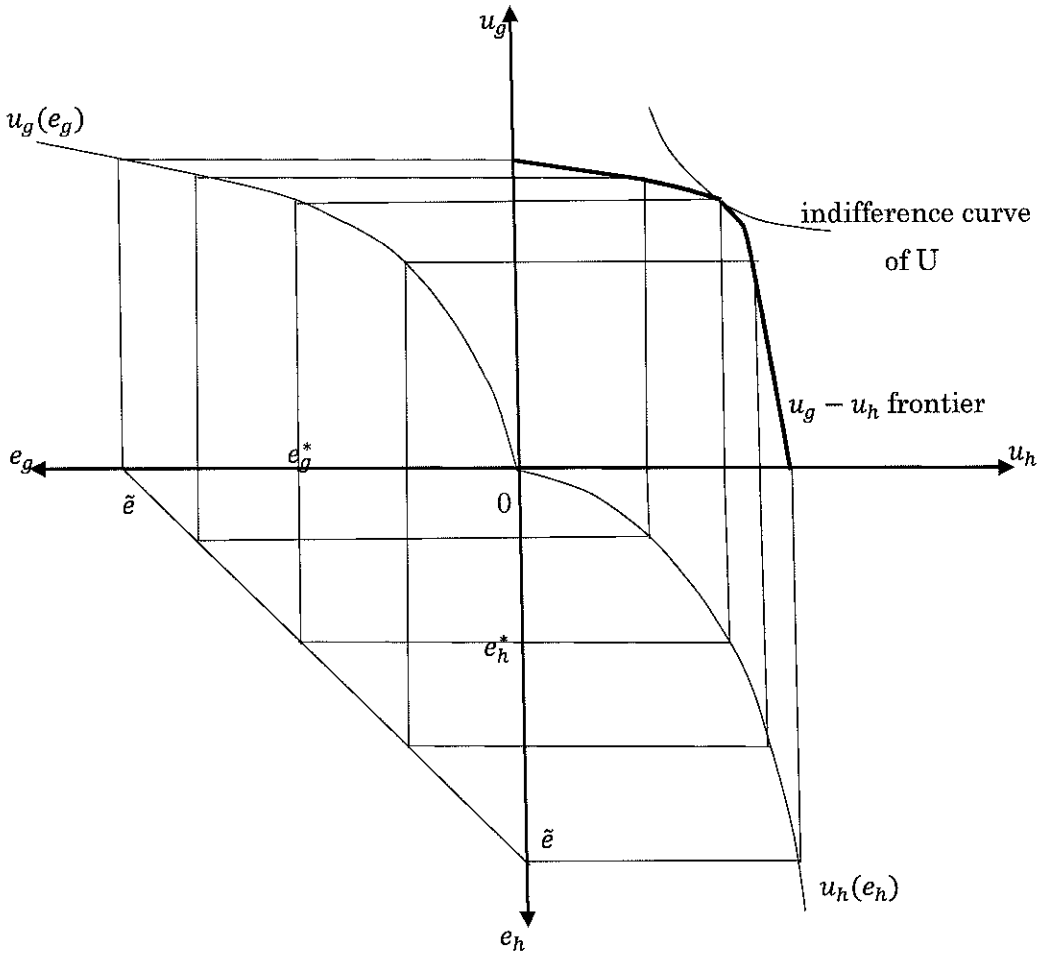

Fig. 3

IV. 2. Market economy

We turn to a usual market economy in which there are many goods and services each

of them is quoted a price. A representative individual is regarded as a laborer instead of a producer. Thus, we may presuppose that it first transform e_g into labor (denoted by l), and then sell it in a labor market. Since l can be viewed as an increasing function in e_g, we assume that $l = ae_g$ for simplicity ($a > 0$). Given the functional properties of U and u_g, a decision making problem of an individual can be transformed to the following allocation problem of energy.

$$\begin{aligned} \text{Max} \quad & \mathrm{U} = \mathrm{U}(u_g(\boldsymbol{x}), u_h(y(e_h))) \\ \text{s.t.} \quad & \boldsymbol{px} = wl = awe_g \\ & e_g + e_h = \tilde{e} \end{aligned}$$

where $\boldsymbol{p}$ and w indicate prices of goods and labor respectively. A simple calculation gives us the following sufficient and necessary condition for a solution.

$$\frac{\frac{\partial U}{\partial u_h}}{\frac{\partial U}{\partial u_g}} = \frac{aw}{p_i} \frac{\frac{\partial u_g}{\partial x_i}}{\frac{du_h}{dy}\frac{dy}{de_h}} \qquad i = 1, \ldots, m \qquad \cdots\cdots (2)$$

From these conditions, we only obtain a demand function of each good and a supply function of labor. In order to close our system to determine a definite level of consumption, we have to take a supply side into account. However, for our application, we do not necessarily need to make the system complete, so we skip it.

V. Application of our argument to economic development

On the basis of our previous argument, we put an interpretation on the failure of foreign aid.

V.1. Historical view of foreign aid and the literature concerning the failure of aid

First, we very briefly view a history of foreign aid according to Easterly (2007). In the 1950s through the 1970s, aid was aimed at investments, mainly public investments for the purpose of accelerating economic growth. However, in 1980s many countries in Latin America and Africa suffered from debt crises, which implies a consequence of unproductive investments while many of East Asian and South East Asian countries succeeded in a take-off. The success of the latter countries inspired the aid donors to shift emphasis from public investments to structural adjustment investments. In the following decade, however, contrary to expectation, there was little or no growth in low-income countries. As a result, those countries had the same suffering as before, that is, the debt crisis. In 2000s, the aid donors often faced requirements of debt forgiveness from

those countries, which forced donors to reconsider the aid policy again. In recent years, the stress of aid has been put on the institutional reforms.

Throughout the history of foreign aid, the toughest countries to deal with are concentrated in Sub-Saharan Africa. Actually, a various kinds of aids have been offered to those countries without any significant effect in the sense of economic development. There exists a vast of literatures discussing the failure of aid in this area. Roughly speaking, the arguments are divided into two categories; namely one is about the way of aid inflow and the other is about internal problems of recipient countries. The former consists of following arguments.

(1) Foreign aids, especially outright grant and soft loan, basically weaken the incentive of self-independence of recipient countries and force them to depend on aids, causing a vicious cycle of dependence (Bauer(2000),Karikari(2002), Grabowski(2006),Moyo(2009),Gerhardt(2010)).

(2) Many aids independently inflow into recipient countries, leading to aid proliferation (Calderisi(2006)).

(3) Tied aids and conditional aids mar the ownership of recipient countries, hindering the desirable economic development(Carlsson et al.(1997),Chabal and Deloz(1999), Manda(2002),Wall(2002),Svensson(2003),Dsei(2005),Boyle(2007)).

On the other hand, the latter includes the following issues.

(1) Recipient countries have not had enough social infrastructure including proper institutions for economic development (Baxter(2002),Grabowski(2006)).

(2) Recipient countries lack human capital who can manage economic development.

(3) A government, bureaucrats (or sometimes a dictator) as aid agency do not work effectively. They very often use foreign aid for their own interest not for the need of people (Chabal and Deloz(1999),Ayittey(2002),Easterly(2002),Lal and Rajapatirana(2007),Acemoglu and Robinson(2014)).

(4) There is a cultural background that prevents economic development (e.g., bad habits, illiteracy etc.)(Prah(2002)).

It is worth noting that this dichotomy is simplistic. Many authors point out the interdependence between them.

V.2. Application of our argument to the failure of foreign aid

We find many researchers criticizing that a blueprint of the Western modernization underlies the foreign aid. They think that development should be suitable for the context of countries concerned and that the foreign aid should be accomplished along this idea.

To this end, they emphasize on cultural matters making up the context of recipient countries (Harrison(2000),Huntington(2000),Landes(2000),Reusse(2002), Abrahamand Dlatteau(2004),Njoh(2006),Andrews(2009)). It is, however, very hard to theoretically or empirically understand the influence of culture on economic development. Thus, what we are going to pay attention to is not culture itself but an attitude of people towards economic development that might well affect their culture.

There is an old saying that 'we have piped unto you and ye have not danced' (Chap.11,Gospel of Matthew, the New Testament). By analogy, we may say for the failure of foreign aid that we have provided you with aids (for development), yet you have not developed. Under these circumstances, almost all arguments about the failure seem to implicitly have the common understanding; namely ' You have not danced because there exist some obstacles barring your intention to dance '. There is, however, another possibility for this situation. That is, ' You have not danced because you are not willing to dance.' In other words, what we put a stress on is the importance of incentives of people for development.

Hypothesis 3

Endogenous incentives to develop play a significant role in economic development.

Now, we return to the argument in section IV and consider its implication to this matter. As long as developing countries are concerned, we may ignore the problem of wastes since the production scale in those countries is not big enough to cause the serious environmental pollution problem. Thus, we may follow the formulations (1) and (2) provided in the section, which give the conditions for an optimal allocation of energy. We pay attention to the left hand side which is nothing but a marginal rate of substitution between two kinds of utility. We denote it by MRS_u in the following.

In (1), it is easily seen by means of Fig.1 that when MRS_u is low, then the optimal e_g is high relative to the optimal e_h, which leads to the increase of the product, and obviously vice versa. In (2), when MRS_u is low, then dy/de_h must be high, which implies a low level of an optimal e_h because of the strict concavity of $y(e_h)$, and vice versa. By aggregating individuals' contribution to production, we have GDP.

Thus, we may assert the following proposition.

Proposition 1

The lower MRS_u is for a representative (or average) individual of a country, the more

the GDP is for the country, and vice versa.

On the basis of this proposition, we consider the failure of foreign aid.
In the framework of our model, the effect of foreign aid is seen as an exogenous impact on the production process as long as the aid is aimed at economic development of a country concerned. From the neoclassical viewpoint, it is supposed to raise productivity of the production process through the investment it finances. As a result, the $u_g - e_g$ curve in Fig.1 shifts upward, leading to an outside expansion of the $u_g - u_h$ frontier. Given MRS_u, an optimal allocation between e_g and e_h is not likely to change drastically, but the increase of the product is expected. Thus, the GDP should rise by the foreign aid. This scenario, however, is just what many researchers have criticized. Actually, it is against the fact observed in many developing countries.

The above argument is based on the neoclassical growth theory that presupposes economic environments of a developed country. When considering a developing country, we need to take into account its specific features. We are going to do it by use of our idea of energy and modify the above argument.

Formally speaking, the increase of productivity through the investment financed by foreign aid is depicted by an upward shift of the graph of $x(e_g)$ (see Fig.4).

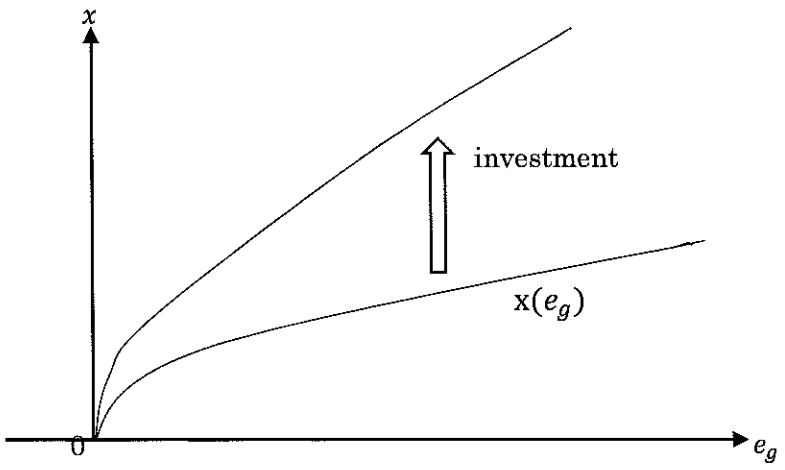

Fig. 4

However, especially in a developing country, the upward shift itself requires a lot of energy of people for both tangibles and intangibles.

Let $x(e_g)$ be a product-energy function before the investment. After the investment, it becomes, say $bx(e_g)(b > 1)$, from the neoclassical viewpoint. However, we need an additional energy for the shift, which is denoted by $\bar{e}_{g2}$ $(= h(b))$. Thus, we should evaluate the effect of the investment as $bx(e_{g1} + \bar{e}_{g2})$ $(= f(e_g),\ e_g = e_{g1} + \bar{e}_{g2})$. To put it

another way, the investment induces a transformation of the product-energy function from $bx(e_g)$ to $f(e_g)$, which can be depicted as a shift of the graph of $bx(e_g)$ to the right (see Fig. 5).

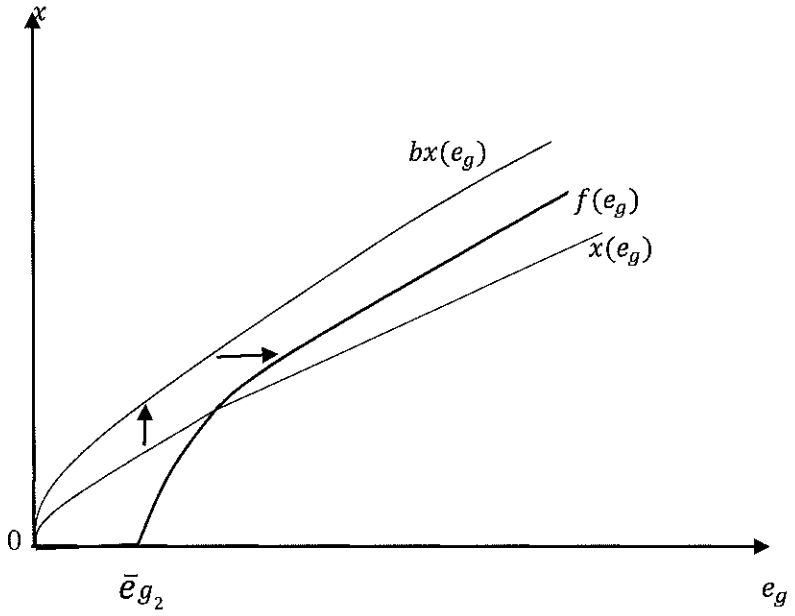

Fig. 5

As an effect of this transformation, we eventually obtain the new $u_g - u_h$ frontier that has a specific position relative to the previous one (see Fig.6).

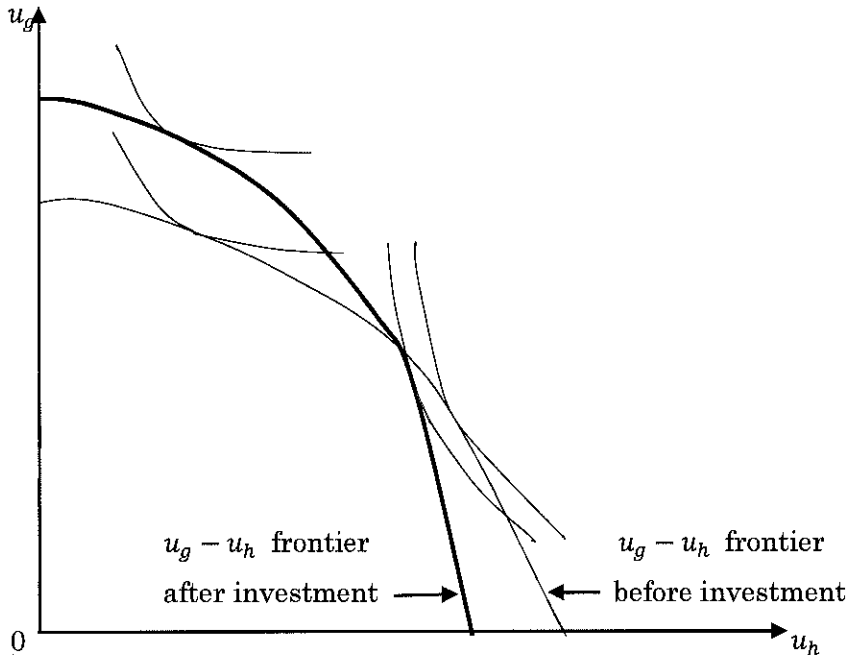

Fig. 6

This position of the new curve (after investment curve) gives us a significance suggestion. It is easily seen that the optimal point after investment gives lower level of U than the one before investment if MRS_u is high. On the other hand, if MRS_u is low, then, the optimal point after investment provides higher level of U than the one before investment.

In addition, if MRS_u is low, the production level is sure to rise while we cannot tell whether it will rise or not if MRS_u is high. These observations lead us to the following proposition.

Proposition 2

A necessary and sufficient condition for foreign aids to succeed in inducing economic development is that the MRS_u be low for a representative (or average) individual of the country concerned.

On the basis of this proposition, we may deduce the following hypothesis.

Hypothesis 4

One of the reasons why the foreign aid fails is that the MRS_u is high for a representative (or average) individual of the country concerned.

It is possible to derive some suggestions from this hypothesis, which are as follows.

(1) It is often observed in a developing country that a big project, once set up with assistance of donors, is thereafter left unused. This is just the situation Fig.6 shows for a case of a high MRS_u. When the MRS_u is high, after investment people get worse in the sense of comprehensive utility, choosing to return to a previous state.

(2) On the contrary, a low MRS_u leads to the increase of GDP after investment. It is worth noting that this economic development pertains to a degrease of e_h. In the long, this effect weakens unity in various kinds of human relationships, which might well deform the social framework. For instance, in many countries with rapid economic development we often observe the trend toward nuclear families and depopulation in local areas and the disappearance of traditional events, which might be interpreted as consequences of the effect.

(3) We consider a representative or an average individual, but this averaging is simplistic. In particular, a developing country shows a variety of peoples' attitude over the country. Broadly speaking, however, we may divide them in two areas; namely the urban area with a low MRS_u and the local area with a high MRS_u. Thus,

if a developing country aims at economic development, a urbanization policy is considered to be useful for it.

VI. Conclusion

What we have done here is summarized as follows. Our argument consists of two parts. One is an extension of utility. The other is its application to economic development, in particular, the problem of the failure of foreign aid.

For an extension of utility, we created a broad concept of the comprehensive utility that includes economic utility. The comprehensive utility consists of three factors; usual economic utility, utility by human relationships and utility by amenities of nature, the latter two of which stem from mentality while the former mainly from materials. We use this extended utility as a criteria for decision making of consumption.

To make our system complete, we created another unique concept of energy. By an analogy to a fundamental idea of thermodynamics, we devised human energy that causes all kinds of activities and assumed it to be given for an individual. All activities but life supporting ones are considered to be related to enhancement of the comprehensive utility. Thus, the given energy is allocated to contribute to the three kinds of utility. As a result, we have an allocation of energy problem in which the comprehensive utility is to be maximized under a given total energy. A solution to the problem leads to an optimal level of consumption.

The merit of this approach consist in that we can deal with not only consumption and production underlying it but also other noneconomic elements from the viewpoint of optimization. In this sense, we have a perspective of applicability of the approach to economic development since we need to take into account noneconomic factors in considering economic development. In the text, we applied the approach to the problem of the failure of foreign aid. As a result, we found that the marginal rate of substitution between two kinds of utility in the comprehensive utility (MRS_u) play a crucial role in determining the performance of foreign aid. Specifically, a high MRS_u of a representative (or average) individual is more likely to cause the failure.

It is worth noting that our approach is based on optimization in an individual's utility. Thus, many consequences accompanying the failure can be interpreted as rational choices in accordance with utility maximization. In other words, many of phenomena observed as a result of the failure of foreign aid have their own rationality.

For instance, we often observe that a big project set up with assistance of donors is

thereafter left unused in a developing country. The reason for it that it is a rational choice of people in the country in terms of utility maximization.

All consequences we obtained in the text were derived by theoretical reasoning. In the process, we followed usual assumptions for properties of relevant functions. Thus, the results are more or less convincing, but still needs some empirical examination to verify, although it is very hard to materialize some concepts given in the text. That will be an issue in the future.

In addition, the framework of our argument is basically static. Thus, from a strict viewpoint, we cannot tell anything about a changing process. To understand how foreign aid influences economic development over time, we need to include time element and consider a dynamical process, which is also a remaining issue.

References

Abraham,A. and J-P. Platteau .(2004). 'Paticipatory development:Where culture creeps in', in Vijayendra, R. and W. Michael.eds., *Culture and public action*, Stanford University Press,Stanford.

Acemoglu,D.and J.A.Robinson,(2014). 'Why foreign aid fails-and how to really help Africa', *The Spectator*, January.

Andrews,N.(2009).'Foreign aid and development in Africa: What the literatures says and what the reality is', *Journal of Africa Studies and Development* 1 (1), 8-15.

Ayittey,G.(2002).'Why Africa is poor', in J. Morris. ed., *Sustainable development :Promoting progress or perpetuating poverty*, Profile Books,London

Bauer,P.T.(2000). *From subsistence to exchange*, Princeton University Press,Princeton.

Baxter,J.(2002).'Another Africa is possible', *Africa Recovery*, 16 (1), 18-19

Boyle,B.(2007).'Beware the ties that bind China and Africa', *Sunday Times*, September.

Calderisi,R.(2006).' *The trouble with Africa: Why foreign aid is not working*, Palgrave MacMillan, New York.

Carlsson,J. Somolekae,G. and van de Walle,N.(1997), *Foreign aid in Africa*, Nordiska Afrikainstitutet, Uppsala.

Chabal,P. and Daloz,J-P.(1999). *Africa works: Disorder as political instrument*, James Curry Publishers, Oxford.

Easterly,W.(2002). *The elusive quest for growth: economists' adventures and misadventures in the tropics*, MIT press, Massachusetts.

Easterly,W.(2007).'Was development assistance a mistake? ', *The American Economic Review*, 97 (2),328-332.

Gerhardt,K.(2010).'Time for a rethink: Why development aid for Africa has failed',

Spiegel Online, August.
Grabowski,R.(2006).`Political development, agriculture, and ethnic divisions: An Africa Perspective', African Development Review, 18 (2), 163-182.
Harrison,L.E.(2000).`Why culture matters', in Harrison,L.E. and S.P.Huntington eds., *Culture matters: How values shape human progress*, Basic Books, New York.
Huntington,S.P.(2000).`Culture counts', in Harrison,L.E. and S.P.Huntington eds., *Culture matters: How values shape human progress*, Basic Books, New York.
Karikari, K.(2002).`Introduction', in Karikari,K. ed., *Where has aid taken Africa? Re-Thinking development,* Media Foundation for West Africa.
Lal,D. and S.Pajapatirana.(2007).`The triumph of hope over experience: A Marshall Plan for sub-suharan Africa', *American Enterprise Institute for Public Research*, 2, 1-7.
Landes,D.(2000).`Culture makes almost all the difference', in Harrison,L.E. and S.P.Huntington eds., *Culture matters: How values shape human progress*, Basic Books, New York.
Manda,G.(2002).`Aid listen,George', *New African*, 411, 50-51.
Moyo,D.(2009). *Dead aid: Why aid is not working and how there is another way for Africa,* The Penguin Group, London.
Njoh,A.J.(2006). *Tradition, culture and development in Africa,* Ashgate Publishing Ltd, Aldershot.
Osei,B.(2005).`How aid tying can impose additional cost on aid recipients: evidence on Ghana', *African Development Review*, 17 (3), 348-365.
Prah,K.K.(2002).`Culture, the missing link in development planning in Africa', in Karikari,K. ed., *Where has aid taken Africa? Re-Thinking development,* Media Foundation for West Africa.
Reusse,E.(2002). *The ills of aid: An analysis of third world development policies*, University of Chicago Press, Chicago, London.
Svensson,J.(2003),`Why conditional aid does not work and what can be done about it? ', *Journal of Development Economics*, 70, 381-402.
Wall,T.(2002).`Is African aid set to rise again? ', *African Recovery*, 16 (1), 3, 29.