FUNDAMENTAL CONCEPTS FOR ECONOMIC SYSTEMS THEORY

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Abstract

In the creation of a new nomenclature for economic systems theory, Nicklas Luhmann's sociological conceptualism may sometimes perform a heuristic role. In particular, the concepts of 'autopoiesis system' and 'observation of observations' can be extremely useful for the analysis of a far-reaching constellation of various economic concepts.

This study develops the elementary terminology of metaeconomics and economic systems theory, and emphasizes the significance of the 'observation of observations'. In most cases when several fundamental concepts need to be logically constructed, the corresponding mathematical symbols and notions may often be utilized as the means for representing their formal functions. Amongst others, 'category' is the most important, because it can formalize the structure of economic systems and meta-observations from the viewpoint of logical foundations.
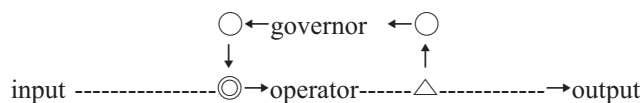
I

Theoretical research studies on economic systems have been conducted since the 1960s and some noticeable results have been obtained by several economists. However, our immediate aim is not to trace the history of economic systems theory, but to frame a new concept of economic systems from a sociological or mathematical (algebraic) perspective. In sociology, in particular, there has been a remarkable development in the theoretical study of social systems since the 1980s. Niklas Luhmann, a German sociologist and social philosopher, may be the leading authority in this field. He elevated a series of sociological researches on system and systematic thinking to a universal social philosophy of mankind or systematic anthropology[1]. His achievements in the methodology of social science have entitled him to rank alongside Max Weber. What types of problems do we encounter when applying Luhmann's sociological theory to economic systems? This is our main point of issue. As a result, in our present research there has been little reference to the existing theories of economic systems. Rather, our topic for discussion focuses on how the structural concept of economic systems can be formulated from

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[1] See, Luhmann (1984 and 1988).

a newly introduced viewpoint. However, a few puzzling and abstruse arguments by Luhmann might be interpreted distortedly and sometimes too rigidly for the convenience of conceptualizing economic systems.

Before elaborating the abstract concept of economic systems we will take an example that is closely linked with real economic activities. Let us suppose that there exists a certain production process. For example, production in a manufacturing industry means a temporary operation by which labor and raw materials are inputted into a factory and then processed with its equipment for manufacturing an end product (output). Men and machines executing this process may be called *operators*. But, as the real activities of production must be regulated according to different economic conditions, they require a certain apparatus for production control named a governor which gives feedback and feedforward on the operation. Thus the following diagram can be drawn:

$$\bigcirc \leftarrow \text{governor} \leftarrow \bigcirc$$
$$\downarrow \qquad\qquad\qquad \uparrow$$
$$\text{input} \text{ ----------------}\circledcirc \rightarrow \text{operator------}\triangle\text{------------}\rightarrow\text{output}$$

Any structure that can be represented by this 'input/output schema[2]' shall be named *system* hereafter. As the two examples below show, the above diagram may find a wide application in economic systems analysis.

[1] Production and distribution systems

The above-mentioned production process can be represented by the following arrow diagram where the operator (the production operator) is located in the middle:

Input of labor and raw materials→the production operator→final products (output).

Similarly, a distribution system can also be illustrated as follows:

Input of products→the distribution operator→objects of consumption (output).

These production and distribution systems are as old as human history itself and continue to exist up to the present day. If we employ the term *satisfaction-of-needs operator*—more briefly, SN operator—as a generic name for production and distribution operators, we can also define a socialist planned economy as a production/distribution system with an SN operator. In a capitalist national economy there are different SN operators in the spheres of household, public finance and economic planning of government.

[2] Market system

We must take account of another significant economic system, that is, a market system. This is a system or field where goods and services are circulated and an exchange operator continues to work successively. In this case it should be noted that there are three distinct types of exchange, i.e. barter, monetary exchange and profit-making—often 'unequal'—exchange. Amongst them monetary exchange performs the important function of reducing concrete objects (goods and services) to abstract forms (commodities). Assuming the establishment of a universal monetary exchange we may consider that a profit-making operator—hereafter, abbreviated to PM operator—plays a fundamental role in various economic systems. It can

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[2] Luhmann (1984), S.24.

always create money both as input and as output. As long as real goods and services are produced as output of the production system, the PM operator may continue to work until money emerges as output in the market system through the feedback subsystem with the PM operator. Marx expressed the total system with a PM operator as M$\cdots$M' (M indicates money and M'$=$M$+\Delta$M (a profit))[3].

Now we can define *capitalist system* as a complex system that builds up and brings in a market system through the medium of a PM operator. It is also a complex of different operators that can formally rationalize everything. For a capitalist system the concrete substance of goods and services may be of secondary importance; what matters for it is the salability and profitability of general commodities, whether or not they may be useful for the life of human beings. Under the global system of capitalism—an ordered set of capitalist systems—such a 'logic' of commodity spreads everywhere.

II

Next we have to consider the universal validity of the system concept. In fact, it may be applicable to any research concerning the different branches of social science. For example, in a nation-state, human input such as members of parliament or bureaucrats can institute a law (output) with the aid of a legislative operator (parliamentary system) accompanied by a judicature feedback (the power of judicial review). However, our aim is not to extend the coverage of the concept, but to appreciate the more general and abstract significance of the 'input/output schema'.

Two different ways of such a signification can be supposed with the emphasis on the role of operator. Firstly, system means 'field' where the so-called 'action through medium' can be observed all around. It indicates a certain space-time or 'history' that is represented by a function or the algebraic relationship of functions. These functions and relationship can be regarded as operators, a few examples of which follow.

Let μ and Φ be a market as an operator and a production function (an eigenvector), respectively. If we denote by λ_e a market price (an eigenvalue), we have

$$\mu\Phi=\lambda_e\Phi \ (0<\lambda_e<+\infty).$$

The same formulation is also applicable to any non-economic 'fields'. We will take the systems of law and politics by way of example. In the case of a criminal trial a certain 'loss function' and 'loss value' are definable, since a decision (output) can be supposed to be a combination of guilt and innocence. The 'loss value' of the death penalty may be considered as infinite. If we denote by Δ, λ_g and L a trial (an operator), a 'loss value' and a 'loss function' respectively, we have

$$\Delta L=\lambda_g L \ (0\leqq\lambda_g\leqq\infty).$$

In the 'field' of politics we can devise a similar formula. For example, in an election the

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[3] See, Marx (1965).

plus or minus of 'monetary loss' according to its success or defeat can be represented as a 'loss value' λ_s under a 'loss function' GL. If we denote by ε an election operator, we have

$$\varepsilon \, GL = \lambda_s \, GL \; (-\infty < \lambda_s < +\infty).$$

Both of these two equations should not be regarded as those proved by experience, but as a set of symbols that show the possibility of theoretical formalization.

Secondly, the operator of a system may be considered to be a morphism or, more visually, an arrow that forms an essential part of the 'category' concept in mathematics. Category is defined as a system of axioms with two types of language, 'morphisms' and 'objects', which are indicated by small letters φ, χ, ψ,...and capital letters A, B, C,...respectively. If we denote by $Hom_X(A, B)$ a set of morphisms in category X, $\varphi \in Hom_X(A, B)$ means that morphism φ is an element of $Hom_X(A, B)$. Then φ must have domain A (an object) and codomain B (another object) with the morphism:

$$\varphi : A \rightarrow B. \tag{1}$$

And if the domain of a morphism $\chi : B \rightarrow C$ is the codomain of φ, the following composite morphism can be defined:

$$(\chi \circ \varphi) : A \rightarrow C. \tag{2}$$

For given morphisms $\varphi : A \rightarrow B$, $\chi : B \rightarrow C$ and $\psi : C \rightarrow D$, the following equality holds:

$$\varphi \circ (\chi \circ \psi) = (\varphi \circ \chi) \circ \psi : A \rightarrow D. \tag{3}$$

Lastly, for each of $\varphi : A \rightarrow B$ and two identity morphisms $1_A : A \rightarrow A$, $1_B : B \rightarrow B$, we have the identity law:

$$\varphi \circ 1_A = \varphi = 1_B \circ \varphi : A \rightarrow B. \tag{4}$$

Category X, in which (1)~(4) hold, is said to have a monoid structure (semigroup with unit element) [4].

In relation to system, domain, codomain and morphism correspond to input, output and operator, respectively. Let us take the example of 'economic theory' as an operator. In this case, a set of economists who are observers of an economic system within its interior can be regarded as input. The 'elements' that constitute the set are remarkable economic theoreticians such as Quesnay, Marx, Walras, Leontief, Sraffa etc. They created their own theories that were made with the free use of certain types of metaphor. Quesnay's *Tableau Économique*, Marx's schema of reproduction, and Leontief's inter-industry relations table etc. are examples of the realized forms of such metaphor. These theoretical systems are the output created by 'economic theory operators' which may have something in common with each other. From the viewpoint of formal structure they all belong to the category of groups, since their structure can be

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[4] MacLane (1986), p.386f.

represented by the same type of matrix group. Thus, we can identify two types of operator (morphism). The first is a theoretical function (an 'economic theory operator') that can be performed through the brains of talented economists who are selected under various social and historical conditions. The second is a revealed morphism—for example, homomorphism in the category of groups—which may appear in the output of theoretical systems.

Such an extended concept of economic systems has a remarkable character as regards its logical content. Next we shall discuss the point in more detail.

III

Every economic system has a significant logical character that may be called self-reference. Its elementary concept must be introduced first.

An interesting problem has often been discussed in set theory, particularly in axiomatic set theory. This is the *Russell's Paradox*, which is deduced from answers to the following question: 'Is S (=a certain set) a member of itself if it is the set of all sets that are not members of themselves?' If S is a member of itself, then it is one of those sets that are not members of themselves and therefore, it is not a member of itself. On the other hand, if S is not a member of itself, then it is entitled to become a member of itself. In both cases contradiction is incurred. We can give a more formal expression of this proposition. Let a set be $V=\{X|\Phi(X)\}$. We indicate by symbols $\in$, $\notin$ and $\rightarrow$ 'include', 'not include' and 'imply', respectively. If we suppose that $\Phi(X)$ means $X \notin X$, we have $V=\{X|X \notin X\}$, therefore, $V \in V \rightarrow V \notin V$, or $V \notin V \rightarrow V \in V$.[5]

Now we can point out a marked characteristic of the set in the paradox. It is noticeable in the above formula that 'V' is defined by 'X'. As the famous logician W. O. Quine appropriately remarked, this type of definition shall cause 'specification of a class by appeal to a realm of objects among which that very class is included[6]'. Henri Poincaré asserted that such 'impredicative' definition should be excluded from logical reasoning[7]. Such a 'definition' often becomes the subject of argument under the name of self-reference. In order to illustrate its meaning we will take up the so-called 'theory of value' presented at the beginning of Marx's *Capital*.[8] The definition of 'value'— 'commodity value'—in Marx's theory may be self-referential, since the 'value' of a commodity is defined by another commodity ('labor-time'). In a capitalist system 'labor' is the expenditure of 'labor-power' in the abstract, and such abstraction can be realized through a market system. Consequently, the abstracted 'labor' becomes a commodity or has the meaning of a commodity. In other words, under the system of capitalism any 'time' must be treated as a commodity, and can obtain its own *raison d'être* provided that it becomes a commodity. In brief, both 'labor' and 'time' are able to have 'values' because the meaning of a commodity is assigned to them. Such a value-assignment may be formally regarded as a morphism, though it may be insignificant to the analysis of a capitalist system. Marx himself was not entirely conscious that he conducted the 'determination of value' with the

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[5] For example, see Cameron (1999), p.2.
[6] Quine (1964), p.125.
[7] Poincaré (1922), p.207.
[8] See, Marx (1965).

aide of such a morphism. Perhaps he might have been incorporated into the circuit of thinking appropriate to a capitalist system. That is to say, capitalism controlled the operation of Marx's brain in its own way! Luhmann suggests that this system must provide different ways of thinking or many types of ideology for its self-preservation or autopoiesis. In fact, these 'products' of value-assignment or valuation continued to be reproduced and systematized within the world of capitalism. Marx was not able to see through this phase of a capitalist system, since he confused its operator with its output. Rather, the situation where Marx could even more exactly observe the social world of his day may be equivalently replaced by the fact that there was a closer interaction between Marx's socialist and materialist ideas and the global complex of capitalist systems and capitalist states at that time.

In any capitalist society there exists an isomorphic interrelationship of time-space, money-space and information-space. Every time-interval can be transacted as a certain volume of money, and the latter always represents a quantity of information. These two one-to-one correspondences cover the entire social life of mankind. In particular, it should be observed that Michael Ende, a famous German novelist, implied in his classical novel *Momo* a dreadful reality of the proverb 'time is money'[9]. In a human society everyone lives their own life through iterating the cycle of social metabolism that is measured by one's proper time controlled by free will. We may call the time *socially proper time* (*sp-time* below). Each of its segments can be reduced to a certain quantity of money in a capitalist society. Ende suggests that most of the proper time of individual grown-up persons may be robbed by a group of suspicious-looking ('gray') creatures. In other words, everyone transforms their *sp-time* into money, while they are unconscious of doing so. As a capitalist system increasingly decomposes every available *sp-time* into money, more and more adult persons lose their *sp-time* and fall into an alienated situation. Moreover, every individual has his or her *sp-time* 'stolen' in the recent network society, where almost anyone is connected with various types of information-transmitting machinery, especially a digital cellular phone. A set of 'stolen' times expressed by a certain quantity of money will become a 'null set', because any sum of money can be represented by a rational number whose measure is zero. Such a mathematical analogy may require some additional comments. In fact, a group of 'time-robbers'—for example, a television, a cellular phone, a multitude of commercial messages, frequently renewed game software, etc.—always strive to transform humankind's life-time function (λ) into a discontinuous, contracted one (δ), or to diminish the power of a set of *sp-time* (T_i, i : the increasing number of the future point of time) by a type of forward transaction, and then to attain the following two equalities:

$$\int_{T_i} \lambda(t)dt \geq \int_{T_i} \delta(t)dt,$$
$$\int_{T_1} \lambda(t)dt \geq \int_{T_2} \lambda(t)dt \geq \cdot \cdot \cdot .$$

Changing the viewpoint, we have another formalization, that is,

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[9] See, Ende (1973), especially Chapter 6.

$$CL_1 > CL_2 > CL_3 > \cdot \cdot \cdot > CL_i > \cdot \cdot \cdot \rightarrow 0 \text{ (measure 0)},$$

where CL expresses a real volume (measure) of everyday human life and i indicates the number of an irreversible order. This decreasing series of piecewise daily contents of life can be interpreted in another way. If $\{CL_i\}$ is an 'object' of the **TOP** (the category of small topological spaces and continuous maps) with its successively contracting codomain (the next domain), it may constitute a chain of automorphisms or identity arrows ($\Rightarrow$):

$$\{CL_1\} \Rightarrow \{CL_2\} \Rightarrow \{CL_3\} \Rightarrow \cdot \cdot \cdot \{CL_i\} \Rightarrow \cdot \cdot \cdot \Rightarrow \{\varnothing\},$$

where the arrow marks out the irreversible course of time or temporal order.

For all events, the theoretical investigation of *sp-time* is essential for the critical comments on Marxian economic doctrines, though it is slightly off the main topic.

So we return to our subject, that is, the examination of the 'self-reference' concept. Apart from its exemplification, we will consider its more general meaning within a social context. According to Luhmann, the term self-reference is applicable to social systems analysis, since 'each element within a social system allows itself self-recurrence by the medium of the other elements[10]'. Therefore, an economic system as a social system can be considered as a self-reference system. Such characterization of an economic system suggests that it may be accompanied by a delicate functional problem. In principle, any economic system can achieve and maintain its autonomy as a social system, though it is likely to have several inherent contradictions. In other words, it continues to secure its self-preservation no matter who tries to control, transform or sometimes destroy it. Of course, the character of self-preservation may manifest itself in other types of social systems too. There are several social organizations such as political bodies, academic societies, bureaucratic machines etc., which possess a prodigious ability of self-preservation. They often tend to persist for the sake of their own formal existence irrespective of their original aims and ideas. Such a tendency may be called the *corporationalizing* of social organizations. A typical corporationalizing process may work as follows: a certain social organization as a 'dynamic equilibrium' system or a *functional system* can be run through an ordinary cyclical operation or 'metabolism', and then it 'grows' along a temporal axis as an autopoiesis system or a *continuous system*, but the deterioration in the intellectual and cultural quality of its members may injure its principles and ideas in spite of the formal survival of that 'organism'. The operators of these two interrelated systems can be represented by two or three types of morphism, that is, a spatial automorphism and a temporal endomorphism or homeomorphism.

Thomas Kuhn, an American scientific historian, keenly pointed out that any organization of scientists shall perform its self-preservation through rigidly maintaining its own 'paradigm,' which is composed of a theoretical system, academic organization, applied field, laboratory equipment etc[11]. This type of organization will continue to exist unless an exceptionally strong and destructive outer impulse is asserted. By advancing such a viewpoint we can determine the potential process of the 'self-destruction' of science. Furthermore, as the tendency toward corporationalizing is increasing in various fields of intellectual and technological activities of

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[10] Luhmann (1984), S.60.
[11] See, Kuhn (1970).

mankind, the future decay of human culture and civilization is likely to be predictable.

However, it is better that we reserve our judgments on this point of issue and change the subject to another theoretical topic concerning economic systems analysis.

IV

We will commence with summarizing the theoretical contents of a famous proposition in quantum mechanics, that is, the uncertainty principle or uncertainty relation. It is formulated by the following relationship between a coordinate (X) and its associated momentum (P):

$$\Delta P \cdot \Delta X \geqq h/4\pi \quad (h: \text{the Planck constant})$$

It means that the less the uncertainty in X (ΔX), the greater the uncertainty in P (ΔP), and conversely. On this occasion it should be observed that the apparatus of observation is put on the inside of a physical phenomenon. Consequently, the objectivity of observation can be obtained only through such a situation. To put it more accurately, the existence of the uncertainty relation must be identified with that of the interaction between the apparatus of observation and a set of observed physical phenomena. If we denote the sets of 'apparatus of observation' and those of 'observed objects' by capital letters A, B... and Greek small letters α, β...respectively, and suppose that all elements of these sets are represented by linear operators, then we can obtain the following two equalities concerning the operations of sum ($+$) and multiplication ($\cdot$):

$$A \cdot (\alpha + \beta + \cdot \cdot \cdot) = A \cdot \alpha + A \cdot \beta + \cdot \cdot \cdot$$

$$\alpha \cdot (A + B + \cdot \cdot \cdot) = \alpha \cdot A + \alpha \cdot B + \cdot \cdot \cdot .$$

Generally speaking, the replacement of these two expressions is logically equivalent to the transformation of morphism $\text{Hom}_X(P, Q)$ into $\text{Hom}_{X^*}(P, Q)$, where X^* denotes the dual category of X and P, $Q \in \text{Object}(X) = \text{Object}(X^*)$. However formally it may be represented, the situation of uncertainty always indicates that the 'apparatus of observation' and the 'observed objects' play the part of input or operator alternately. In quantum mechanics such a problem of uncertainty seems to be examined from the viewpoint of the 'contraction of a wave function'.

Now we will replace the words 'apparatus of observation' with 'observer', and consider the problem of observation and uncertainty in a social context. In my article on industrial revolutions[12] I have already dealt with Karl Popper's arguments on social observation and called them the 'principle of social uncertainty'. His assertion may be that any observer of a society can only make an objective observation of it after he has been self-conscious about his standpoint of input as well as that of operator in a social system. Broadly speaking, he suggests that every social event might become an object of operation and at the same time an operator. This aspect of Popper's 'principle of social uncertainty' has been extended to social systems analysis by Luhmann. We will next proceed to examine one of his theoretical contributions to

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[12] See, Kamitake (2008), Chapter 5.

this type of analysis.

All human social activities are composed of a set of messages that can be reduced to information exchanges. However, different messages must be combined to form a circle of communication for their social integration, since each of them has an unsocial or one-way character in itself. From this viewpoint any economic activities, especially the exchange operation of goods and services can be regarded as a set of messages. Moreover, we can consider the observation of economic behavior as a social event within an economic system, because every observer as an operator produces information as output. In any economic system there is another type of observer who observes the observing direction and the result of observation that is performed by the former observer. This type of observation that Luhmann called the 'observation of observations[13]', though it implies a certain transcendental aspect, may be offered from economic activities of the everyday life of mankind.

For example, if a consumer organization conducts market research, most producers cannot be indifferent to its intentions and results, and in the case of need, they may conduct their own information-gathering concerning it. When the market behavior of a private firm is subject to the supervision of a government organ that is established outside the market system, the firm observes its observation from the inside of the market and if circumstances require it will exercise restraint in dealings that may be judged illegal. And if any decision-making of a certain government authority has any influence on the existing framework of economic policies, it shall induce all the members of a given national economic system to observe manifestations of the governmental observation. In particular, any economist as a special observer has to take the same action, and observe the aggregate observations of all concerned including him.

If we consider our society as an intricate piece of information, we can easily follow such a line of sight as the 'observation of observations', since a complex interaction among human beings as operators is always 'uncertain'; that is, both positions as an object of operation and as an operator can be mutually alternating. As we cannot tell in advance whether the object is a system or not, we should call any object of operation an 'environment (*Umwelt*)'. In fact, Luhmann elaborated in detail the 'system/environment' theory including a view on the 'observation of observations', and applied it to the interpretation of socioeconomic phenomena[14].

A series of 'observation of observations' may be finitely continuous and sometimes create a game-like situation. On the other hand, there can be a negative observation that is conducted in the form of disclosure or the choice of information. In that case only a small part of information that cannot be observed efficiently is disclosed, while the other information is not covered by ordinary observations. Consequently, such a situation may bring about, as it were, a state of 'discommunication', where a social connection between messages can be broken off arbitrarily.

We can take several examples concerning economic affairs such as an unlawful transaction in securities, an off-the-book deal, a secret price-fixing cartel etc. However, a theoretically significant case of 'observation of observations' can be found in the situation of an unsolvable game due to self-reference. Let us consider this point using Luhmann's commentaries.[15]

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[13] Luhmann (1988), S.119.
[14] See, Luhmann (1984).
[15] Luhmann (1988), SS.119-120.

We treat the following two assumptions or propositions as a subject for observation:

1) 'all the suppliers of a certain good are paid a profitable price for it',
2) 'all the suppliers of a certain good are not paid a profitable price for it'.

Situation 1) boosts production excessively and therefore may be judged socially 'false', while in 2) all suppliers are obliged to shut down production, which is regarded as a correct ('true') judgment. If a certain supplier can observe the other suppliers who act on these assumptions, he makes a 'true' determination not to produce when they produce on assumption 1), but he makes a 'false' determination to produce when they do not produce on 2), other things being equal. However, if the other suppliers make a 'true' determination not to produce in the former case, his determination not to produce becomes 'false'. The reverse is true of the latter case.

Thus any decision-making of an observer of observations shall incur a contradiction in semantics. There is a similar treatment of the problem in game theory, but another, more universal type of problem is also explored in the theory of the 'observation of observations'. For example, it must be able to handle the question: 'what kind of decision does a certain supplier make when he observes the behavior of the other suppliers who observe each other from the viewpoint of game theory?' In any event it is certain that any scientific investigation of social uncertainty results in the theory of 'observation of observations'.

V

Lastly in relation to the above theoretical research we will make some crude distinctions among various economic observations. There are several phases of economic 'observation of observations' that can be conducted by different economic units or economic observers such as consumers, entrepreneurs, investors, politicians, journalists and economists. Three types of metaeconomic observation may be distinguished.

First, consumers or entrepreneurs obtain some economic information directly from mass media, and observe the present economic conditions. Moreover, they mutually observe in the above-mentioned game-like situation, and at the same time conduct observations about the economists' policy proposals or the political platform of the ruling party. These observations may appear as the first stage of economic 'observation of observations'.

Then, there is a particular type of economist who observes the economic observations of various economists. He is an economic historian or a researcher on the history of economics. The historical study of economics may constitute a valuable contribution to the second stage of economic 'observation of observations'. For example, Karl Pribram conducted the methodological examination of several 'metaeconomic concepts' to clarify the universal influence of Western thought on economic doctrines[16] . However, the object of observation in many historians of economics has been limited to the theoretical models of economics and economic policy. Therefore, the overall picture of economic theory and history must be objectified through a more comprehensive viewpoint.

As was previously mentioned, Kuhn analyzed the common structure of sciences including

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[16] Pribram (1983), p.621f.

CHART 1

Type 1   economists as men of culture
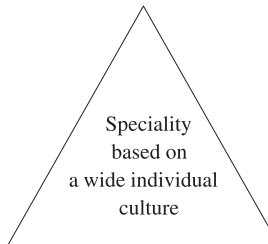
The direction of specialization

Speciality
based on
a wide individual
culture

CHART 2

Type 2   economists of excessive specialization

The direction of specialization

The growth of
speciality
and
the decline of
individual
culture
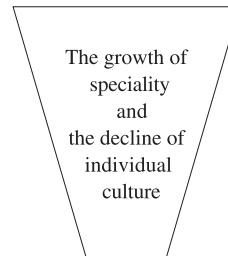
CHART 3

Corporationalizing process:
   1) declining functional system
   2) continuous system with aging

Type 1 → Type 1 and Type 2 → Type2
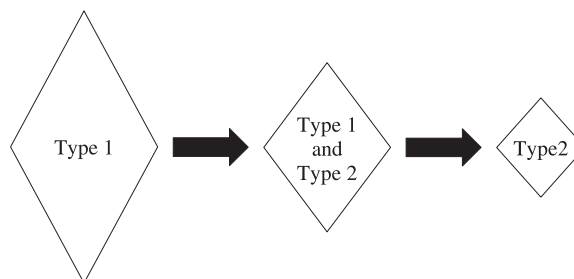
economics with the paradigm concept. If we base ourselves on his argument, we can not only grasp the universal meaning of economic theory and its application, but also inquire into the organization of an academic conference on economics and its evaluation system of achievements in economic research. Such a viewpoint allows us to perform the third stage of economic 'observation of observations'. However, the change of viewpoint is still unlikely to be sufficient for metaeconomic observation. As metamathematicians analyze the structure of mathematical proofs and theories with the aid of symbolic logic, so we must work out the effective methodology of metaeconomics that can create the third stage of economic 'observation of observations'. To mention a single and simple example of the metaeconomic 'observation' of a typical faculty of economics in Japanese universities, the following 3 charts may illustrate the corporationalizing process of its system. Chart 1 shows an image of representative Japanese economists of the prewar generation. They may be regarded as the 'men of culture' defined classically by Matthew Arnold[17]. Chart 2 illustrates an image of the expert economists of American style who formed the postwar generation and represented the mainstream of economics in Japan, especially after the 1970s. The corporationalizing process of the faculty system is demonstrated in Chart 3. Generally speaking, as Type 2 economists become superior in number to Type 1 and thereby managerial and bureaucratic opportunism gradually overwhelms purely academic liberalism, the faculty as a functional system is working badly both intellectually and culturally, but it still exists persistently as a continuous system.

REFERENCES

Arnold, M. (1993), *Culture and Anarchy and Other Writings*, edited by Stefan Collini, Cambridge University Press.

Cameron, P. J. (1999), *Sets, Logic and Categories*, Springer.

Ende, M. (1973), *Momo oder Die seltsame Geschichte von den Zeit-Dieben und von dem Kind, das den Menschen die gestohlene Zeit zurückbrachte*, Stuttgart und Wien, Thienemann.

Kamitake, Y. (2008), 'The Formal Structure of Industrial Revolutions', in *Hitotsubashi Journal of Social Studies*, Vol. 40 No.1.

Kuhn, T. S. (1970), *The Structure of Scientific Revolutions*, 2nd ed., The University of Chicago Press.

Luhmann, N. (1984), *Soziale Systeme*, Frankfurt am Main, Suhrkamp.

Luhmann, N. (1988), *Die Wirtschaft der Gesellschaft*, Frankfurt am Main, Suhrkamp.

MacLane, S. (1986), *Mathematics: Form and Function*, New York, Springer-Verlag.

Marx, K. (1965), *Capital*, Vol.1, Moscow, Progress Publishers.

Poincaré, H. (1922), *Science et Méthode*, Paris, E. Flammarion.

Pribram, K. (1983), *A History of Economic Reasoning*, Baltimore and London, The Johns Hopkins University Press.

Quine, W.O. (1964), *From a Logical Point of View*, 2nd ed., Cambridge, Harvard University Press.

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[17] See, Arnold (1993).