Relation exchange as the model of bounded rationality

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Title:

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Abstracts:

Human cognition begins with perceptions, from which intuition comes off as fast, parallel, automatic, effortless and emotional system. Reasoning is slow, serial, controlled, effortful and rule-governed system of cognition (Kahneman 2003). The architecture of rational agent model is built on the unrealistic assumption of single cognitive system which has the logical ability of a flawless system of reasoning. However, human beings are likely to act intuitively, which is at odds with the premise of rational agent model. The process of sympathy and consent may be considered as the conduit between different cognitive systems of different individuals. Then, the relational interactions among individuals, i.e., relation exchange, should be conceived as the outcome of sympathy-consent process (Rhee 2012b, 2016b). The fundamentality of relation exchange in comparison with value exchange vindicates the legitimacy of relation exchange as the model of bounded rationality.

Keywords

Cognitive system, sensory order, sympathy-consent process, relation exchange, open/indeterminate system, bounded rationality

JEL code: D01, D03

I. Introduction

Although economics wasn't able to present the model of bounded rationality yet (Maskin and Tirole 1999a), recent studies of behavioral approach (Kahneman 2003) attained landmark successes to set milestones which illuminate on the direction for us to follow. The great contribution of behavioral studies is the enlightenment on the fact that human understanding and knowledge begin with perception and that there is sensory order (Hayek 1952). In this regard, Hume (1739) is considered as the precursor of behavioral approach.

The building of cognitive architecture begins with the perception at each instance of experience, which gives rise to intuition as fast, parallel, automatic, effortless, associative, slow-learning and emotional process (Paul Rozin and Carol Nemeroff 2002; Daniel T. Gilbert 1989, 2002; Timothy D. Wilson 2002; Seymour Epstein 2003). It is amazingly similar to Humean impression (Hume 1739). Reasoning comes off later as slow, serial, controlled, effortful, rule-governed, flexible and neutral process (Kahneman and Frederick 2002; Ellen J. Langer et al. 1978; Simon and William G. Chase 1973; Gary Klein 1998; Atul Gawande 2002; Shelly Chaiken and Yaacov Trope 1999; Kith E. Stanovich and Richard F. West 2000, 2002; Kahneman 2003). Hume (1739) found the connection points between impression and reasoning from the causation structure of epistemology, which adopted relations of ideas and matters of fact as two instruments.

The outcome of behavioral studies is that intuition and impression are more accessible (E. Tory Higgins 1996) and directly affect the process of decision making than reasoning.

Consequently, reference point affects the judgment process since reasoning becomes reference dependent (loss aversion: Kahneman et al. 1991; Tversky and Kahneman 1992). Decision making remains passive to the framing formulation (invariance: Tversky and Kahneman 1986; narrow framing: Kahneman and Daniel Lovallo 1993; mental accounting: Thaler 1985, 1999; decision bracketing: Daniel Read et al. 1999). Judgment heuristics leads to systematic biases which make discrepancies between the dictations of intuitive judgments and extensional reasoning like probability principles, Bayesian inferences and regression analysis (Tversky and Kahneman 1974, 1983; Kahneman 2003).

What the studies of behavioral approach add up to indicate seems the unrealistic relation between human cognitive structure and rational agent model. As a conclusive remark, Kahneman (2003) said "all indicate that the traditional separation between belief and preference in analyses of decision making is psychologically unrealistic." They have to be integrated in the coherent analytics of human cognitive structure. It is amazing that the behavioral studies amount to provide experimental evidences to the corroboration of the empiricist approach.

The grand question, which challenges to the attempts to embed the cognitive structure of behavioral studies into the rebuilding of economics, is how to explain the interaction between and among individuals? Since Adam Smith (1776), economics has confined the analysis only to the cases of market exchange. However, the interactions among individuals are much more comprehensive matters than those which are restricted to the activities confined to the market. Sympathy is the common response from empiricists (Hume 1739, 1751; Smith 1759). From different direction, public choice approach proposed public consent as their response to the question (Buchanan and Tullock 1962). In economics literature, relational exchange (or

relational contract) has been a familiar issue (Macneil 1978; Williamson 1985; Dore 1983; Goldberg 1980; Richardson 1972), where the effects of relational interaction are imbedded into the analytics of rational agent model.

Relational interaction among individuals, while individuals are separated by different schemes of cognitive system respectively, may be regarded as the outgrowth of behavioral action. The process of sympathy and consent may be considered as the conduit between different cognitive systems. Then, the relational interactions among individuals should be conceived as the outcome of sympathy-consent process (Rhee 2012b, 2016b). Since this process of sympathy and consent is indeterminate, incomplete, coincidental, emotional rather than rational and path dependent, the relational interactions among individuals share same attributes as well.

As the analytical lineage from sympathy-consent process to relational interaction draws out from the cognitive systems of different individuals, the natural question that follows is: how the relational interactions among individuals are compared with the value exchange of the market in the rational agent model? Approach to this question seems to bifurcate at this juncture: empiricism versus value-cost rationalism. The traditional rational agent model belongs to the value-cost rationalism approach. On the other hand, the experimental results of behavioral studies support the empiricism approach. Although the philosophical traditions are distinctively different between two approaches, it seems necessary to rekindle our attention to the fact that the approach of value-cost rationalism requires as premise the consistent measuring of value-cost indices, which often appears as transitivity, reflexivity and symmetry in the textbook.

The experimental studies of behavioral approach are conceived as the corroboration of nascent Humean empiricist approach of economics in section II. The sympathy-consent process is introduced as the conduit of interactive actions among different cognitive systems in section III. It serves as the foothold to uphold the sympathy-consent dimension as the analytical dimension of bounded rationality. Open/indeterminate system is distinguished from closed/determinate system in section IV, which will distinguish empiricism approach from value-cost rationalism approach. In section V, path dependence is introduced as the idiosyncratic attribute of empiricism approach. The legitimacy for the model of bounded rationality is vindicated by the proof of the fundamentality of relation exchange over value exchange in section VI. Important ramifications including the path dependence of pricing, which put in place significant meaning on the learning of economics are introduced in section VII. Section VIII summarizes the paper and presents conclusive remarks.

II. Behavioral studies and Humean empiricist approach

The findings of behavioral studies support that our decisions are not determined by rational choice but by "the common-sense psychology of the intuitive agent" (Kahneman and Tversky 1973; Tversky and Kahneman 1974; Kahneman et al. 1982). "Rational (agent) models are psychologically unrealistic" (Kahneman 2003). As the outgrowth through the attempts of behavioral studies (Kahneman and Shane Frederick 2002), the analytical architecture of cognitive process began to shape up (Kahneman 2003). Intuition is the reflection of perception, although "most judgments are and most choices are made intuitively." However, both belong to the same system in the analytical architecture that deals with direct feelings

from experiences as the first cognitive step. Perceptions and intuitions are carried out fast, in parallel, automatically, effortlessly, associatively, as slow-learning, and emotionally (Paul Rozin and Carol Nemeroff 2002). Reasoning is slow, serial, controlled, effortful, rule-governed, flexible and neutral process of human cognition (Kahneman 2003). “Reasoning is done deliberately and effortfully, but intuitive thoughts seem to come spontaneously to mind, without conscious search or computation, and without effort” (Daniel T. Gilbert 1989, 2002; Timothy D. Wilson 2002; Seymour Epstein 2003; Kahneman 2003).

Assumption EC (empiricist cognition): The basis of human cognition is founded on human perception, impression, and intuition.

It is amazing to witness the similarity between the cognitive process of benavioral approach and Humean epistemology. Both approaches recognize that human understanding essentially begins with experiences, that the perception from feeling is the most primitive step, that “most thoughts and actions, i.e. reasoning, are normally intuitive” (Kanhneman 2003). It seems that the seminal achievement of behavioral studies amounts to the opening of gateway to the introduction of empiricist approach in the study of economics as contrasted with the (value-cost) rationalist approach of traditional economics.

Although the studies of behavioral approach successfully launched the groundwork for the construction of the model of bounded rationality by presenting empirical evidences which invalidates the premises of rational agent model, the cardinal work of presenting the model of bounded rationality is yet to come. “Incorporating a common sense psychology of the

intuitive agent into economic models will present difficult challenges, especially for formal theorists. It is encouraging to note, however, that the challenge of incorporating the first wave of psychological findings into economics appeared even more daunting 20 years ago, and that challenge has been met with considerable success" (Kahneman 2003).

This work of building the model of bounded rationality seems to have to begin with the recognition that the capacity of human intelligence essentially falls short of from what is needed to meet the requirement to fulfill the operation of value-cost rationality accounting. It is the bedrock assumption of bounded rationality study. If we set the focus of our attention to the problem of exchange activity, there are three branches of problem to note among buyer, seller and goods to exchange.

The first problem is the cognition problem between buyer and good to exchange. What we know from the perception or experience is not the thing in itself, but its image. So, our perception or intuition is affected by heuristics (Kahneman an Tversky 1973; Tversky and Kahneman 1974; Kahneman et al. 1982) and framing (Tversky and Kahneman 1981, 1986). It is not even certain that human being has ability to present the unalterable schedule of preference ordering among different goods. Logically extensional reasoning is often repudiated by intuitive reasoning and conjunctive fallacy was not unusual in probability judgment (Tversky and Kahneman 1983) in behavioral experiments.

Secondly, the relation between seller and the good to exchange is no better, although we may think that the seller is better positioned to count production cost accounting. Alchian and Demsetz (1972) already tracked down the dilemma of metering problem. The management of firm is the problem of open/indeterminate system (Rhee 2013b, 2016b). Depending upon the

ability to exercise entrepreneurship and innovation, the cost accounting may easily change. Not even the ordering of cost accounting among the goods products is not unalterable.

Thirdly, as for the problem of relationship between seller and buyer, there are a lot of uncertain factors. Most of all, the information asymmetry and opportunistic behavior may cut in into the trust relation, which may deteriorate trust relationship. This deterioration of trust relationship tends to cause market failure (Akerlof 1970).

III. Sympathy-consent dimension

All three arguments amount to saying that exchange transaction cannot be carried out by the value-cost accounting only. There is the problem of bounded rationality. Then, what is it that makes up the value-cost accounting and accomplishes exchange transaction? To gain insight, let's go to human cognition process. Everyone takes perception from experiences. From repeated experiences of perception, we arrive at the position to conduct reasoning (Kahneman 2003). Essentially, this finding is quite parallel to Humean epistemology (Hume 1739).

Everyone is lock-in into the territory of understanding and knowledge confined by personal experience and cognitive limitation. The only conduit between cognitive territories, through which everyone communicates with everyone else, is the sympathy. In order to draw out the principles of moral philosophy, the role of sympathy has been recognized by Hume (1739) and Smith (1759). However, for utilitarian purpose, the situation is not different to empiricist approach in general. For the individuals who have to rely on personal experiences to gain knowledge and understanding, the sympathy is the only conduit to make interaction with

other individuals even for utilitarian purpose.[1]

According to rational agent model, goods in the market are represented by value-cost measure only. However, the cavity of human intelligence prevents the decision making of human beings from being dictated according to the value-cost measure. Due to bounded rationality, there comes the undetermined territory in decision making. How to navigate the undetermined territory to arrive at the decision making? It is the navigation for the communication between the realms separated by the territories of personal experiences of individuals (Smith 1759; Hume 1751). It will be called sympathy-consent process in aggregate (Rhee 2012b, 2016b). Borrowing from Hume's terminology, sympathy is the passion by which the commutation is attained between respectively different realms of cognition of different individuals. Here, passion means to indicate the power of abstract sentiment.[2] Such realms of cognition are built on perceptions and intuitions which are obtained from the experiences of individuals.

Definition SCP (sympathy-consent process): The sympathy-consent process is the commutation process of utilitarian purpose between or among respectively different realms of cognition of different individuals when human cognition is drawn from the perceptions and intuitions that are obtained from the experiences of individuals.

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[1] Hume used utilitarian motivation when drawing out the principles of morals among individuals (Hume 1739, 1751).

[2] I owe to Professor Sang-Ook Lee of Hanyang University for the interpretation of the concept of passion.

Rhee (2012b) proved the fundamentality of sympathy-consent process and relation exchange as the action outcome, vis-à-vis value exchange, with the assistance of path dependence. Path dependence is the idiosyncratic attribute of sympathy-consent process. Due to the proof (Rhee 2012b), we established the sympathy-consent dimension, which contrasts with value-cost rationality dimension. As to be introduced later on, the relation exchange, which is the outcome of sympathy-consent process, will replace the traditional exchanges in the market and extends the scope of exchange from the market to interpersonal interactions in general.

IV. Open/indeterminate system

Rational agent model is built on the premise that at any incidence, it is possible to measure value-cost indices consistently.[3] It is what is implicated by the rationality assumption. Without this premise, it is not possible to operate rational agent model. With this premise, it is possible to operate the optimization-equilibrium algorithm. In other words, the state of economy is identified only as the outcome of optimization-equilibrium solution in the rational agent model. In the sense that the recognition of economic state is confined by the optimization-equilibrium algorithm, this approach of economics is defined to be closed/determinate system (Rhee 2013b).

[3] Rationality of decision making is built on transitivity, reflexivity, and completeness of individuals' preference (Arrow and Debreu 1954; Arrow and Hahn 1971).

Definition CDS (closed/determinate system): the domain of economy where economic states are identified by optimization-equilibrium algorithm upon the premise of consistent measuring of value-cost indices is defined as closed/determinate system.

However, the economy of real life is much more deeply and complicatedly mingled than is able to be identified by the optimization-equilibrium algorithm only. Most of all, the premise of consistent measuring of value-cost indices is unrealistic. Number or index is not the fundamental underpinning of human knowledge and understanding (Kahneman 2003). Perception does not begin with number or index, but likely with emotion or feeling (Tversky and Kahneman 1981, 1986) or impression (Hume 1739). Perception and intuition (Kahneman 2003) or impression and image (Hume 1739) are primary steps of cognition process than reasoning (Kahneman 2003) or idea (Hume 1739). Intuition or impression is more accessible in cognitive sense than reasoning (E. Tory Higgins 1996; Kahneman 2003) and idea (Hume 1739) are not.

The extensionality and invariance of preference are an essential aspect of rationality (Kenneth J. Arrow 1982; Tversky and Kahneman 1986).[4] However, "invariance is violated in framing effects, where extensionally equivalent descriptions lead to different choices by altering the relative salience of different aspects of the problem" (Tversky and Kahneman 1981).[5] People rely on heuristics when making judgments under uncertainty (Kahneman and

[4] This invariance is equivalent to the premise of consistent measuring of value-cost indices (Rhee 2016b).

[5] Quotation is brought in from Kahneman (2003).

Tversky 1973; Tversky and Kahneman 1974; Kahneman et al. 1982). Heuristics stems from percepts and intuition because the latters are more accessible in cognition process (Kahneman 2003). In behavioral approach, the role of emotion is more highlighted in its influence on the making of percepts and intuition (Kahneman 2003).

The extensionality and invariance is another expression which recites the premise on the consistent measuring of value-cost indices. Behavioral studies, i.e., heuristics, framing and reference point of prospect theory (Kahneman and Tversky 1979), raise question on the reality of the premise of the rational agent model. The root-core problem is the difference of cognitive systems into which perception-intuition and reasoning are pigeonholed. Rationality and its premise belong to the cognitive system of reasoning. However, human knowledge and understanding including heuristics comes from more accessible cognitive system of perception and intuition (Kahneman 2003) and impression (Hume 1739). Due to the coincidental development of perception or intuition system, the extensionality and invariance of reasoning system becomes untenable in cognitive process. That is, the premise of consistent measuring of value-cost indices becomes untenable.

Definition CDS is built on the premise of consistent measurement of value-cost indices. Hence, the failure to uphold the consistency of measurement of value-cost indices and its consequence to the state of economy lay ground for the making of the open/indeterminate system.

Definition OIS (open/indeterminate system): the states of economy which is defined by the interactions between and among individuals when the premise of consistent measurement of

value-cost indices fails to be upheld.

Clearly, the domain of economy, which is defined by heuristic, framing and reference point that are built on perception and intuition as more accessible cognitive system than the extensionality and invariance of reasoning, belongs to the category of open/indeterminate system.

In the open/indeterminate system, coincidence begins to matter. In the closed/determinate system, the solution always ends up as the outcome of optimization-equilibrium algorithm. There remains no place for the coincidental factor to cut in into. However, in the open/indeterminate system, the coincidental factors, which come as more accessible step in cognitive process such as perception and intuition (Kahneman 2003) or impression and image (Hume 1739), are enforced to the actions in the next step of cognitive system such as reasoning.

From the definition, the rational agent model belongs to the closed/determinate system. The empiricist approach of economics, as defined in Rhee (2016b), presumes that human beings learn understanding and knowledge from experiences. From experiences, they obtain perceptions-intuitions or impression as the primary system of cognitive process. Sympathy-consent process is the conduit through which the commutation is carried out between and among different cognitive systems of different individuals. The empiricist approach of economics belongs to the open/indeterminate system.

Proposition SCP-OIS (sympathy-consent process belongs to open/indeterminate system): Sympathy-consent process belongs to the open/indeterminate system.

Proof:

Sympathy-consent process is the commutation process between and among individuals when each individual's cognition comes from the perception (Hume 1739; Kahneman and Tversky 1973). In sensory order (Hayek 1952), the perception and intuition are more accessible than reasoning or conceptual representation (Kahneman 2003, Figure 1). In other words, in the cognitive structure of human beings, it is not possible to uphold the premise of consistent measurement of value-cost index. Hence, the sympathy-consent process belongs to the open/indeterminate system.□

The instances of human life tend to unfold the feature of coincidental occurrence. That is because the cognitive system of human beings begins with perception and impression. There is sensory order. Perception and impression come first, which go through association steps (Hume 1739) to put in shape of heuristics, framings and reference points. Emotion tends to have efficacy (Kahneman 2003).

Trust, friendship, affection or misgiving, enmity, antipathy and on and on are the examples of relational specificity (Williamson 1971, 1985) which have efficacy on the operation of sympathy-consent process and relation exchange. Relational specificities as such are the outcome of cognitive abstraction according to the principles of resemblance, contiguity in

time and place, and causation (Hume 1739) or conceptual representations which lead to the making of heuristics, framing and reference points (Kahneman 2003).

Definition RX (relation exchange): Relation exchange is defined as the interpersonal interactive actions which take place between and among individuals when the cognitive system of individuals is built on the perceptions and impressions as the base ground of human understanding and knowledge.

Relation exchange is the interpersonal interactive actions between and among individuals.[6] Since human cognition stems from perceptions, impressions, and intuitions, the sympathy is the only conduit through which individuals make interaction between and among themselves. In other words, relation exchange is attained through the process of sympathy-consent.

Proposition RX-SCP (relation exchange as the outcome of sympathy-consent process): Relation exchange is attained as the outcome of sympathy-consent process.

Proof:

[6] Relation exchange is distinguished from relational exchange in the literature (Macneil 1978; Richardson 1972; Goldberg 1980; Dore 1983). The latter approaches recognized the relationship as efficacious determinant of exchange transaction. However, they failed to recognize relation exchange as the actions of sympathy-consent process, i.e. empiricist approach of economics.

Human cognition is built on the perceptions, impression, and intuition, all of which are obtained through personal experiences (Assumption EC). Sympathy is the only conduit which connects the cognitive systems of individuals. Since relation exchange is the interpersonal interactive action between and among individuals, the sympathy-consent process is the only available system which attains the action of relation exchange.□

It should be cleared up that Proposition RX-SCP does not recognize the process of sympathy or consent as the primal step before the action of relation exchange. The existential entity is relation exchange, not sympathy-consent process. The sympathy-consent process recognizes the distance between cognitive system and relation exchange. The process to fill the gap of distance is called the sympathy-consent process. In other words, we don't have to feel stressed to pretend the realistic feature of sympathy-consent process. Sympathy-consent process tends to appear as an explanation ex post to account for relation exchange. It is a fictitious-artificial but necessary step.

Sympathy-consent process may have to account for opportunistic behavior if unlucky or trust exchange if lucky. It is the analytical space which remains as open/indeterminate system. Naturally, negative relationship may exist, for instance, antipathy, enmity, envy and so on. Likewise, the relation exchanges as such follow suit. Every relation exchange is beneficial to every participant, as reveals in the following.

Every relation exchange gives rise to division of labor. As is demonstrated in the story of pin production (Smith 1776, book I, chapter 1), productivity increase lifts off by the introduction of division of labor. Assuming the utilitarian behavior of decision makers, the

propensity to conduct relation exchange is the natural turnout of human behavior. Interactive exchanges between and among individuals, which stem from negative relationship, are harmful to participants just as they wreak havoc on the division of labor.

V. Path dependence

An idiosyncratic attribute of empiricist approach is path dependence. A coincidence may happen as an outcome of cognitively accessible steps like perception, intuition or impression. However, it gives rise to the effect. Experiences take place fortuitously. Coincidence is unavoidable attribute of experience. However, the incidences of perception, intuition, and impression hold effects on to the actions of relation exchange and sympathy-consent process (Rhee 2012b; Hume 1748, Section VI Of probability). Path dependence is the idiosyncratic attribute of sympathy-consent process.

Proposition PD-SCP (path dependence of sympathy-consent process): Path dependence is the idiosyncratic attribute of the sympathy-consent process.

Proof:

The cognitive system of human beings is built on the perceptions, intuitions, impressions, conjunctions thereof, matters of facts as the outcome of cause and effects, and relations of ideas (Hume 1739). Perceptions come off as coincidental incidence. However, their effects pertain to the successive steps of cognitive functioning. Path dependence is the idiosyncratic

attribute of the empiricism (Rhee 2016b). The sympathy-consent process is the interpersonal interaction between and among different cognitive systems of different individuals. Hence, the sympathy-consent process cannot but inherit the path dependence as the legacy of empiricist approach.□

What is the condition for the recognition of the sympathy-consent process as the analytical dimension? It should be the recognition of sympathy-consent process as the exclusive source of explanation for the making of exchange. In the rational agent model, price is the kernel point for the determination of exchange, which takes place in the market. In the sympathy-consent dimension, relation exchange replaces the role of price. So, not merely the exchange in the market, but also any interpersonal interactive action between and among individuals which takes place outside of the market becomes the action of relation exchange.

Then, what is the position of price in the sympathy-consent dimension? To understand this, we should compare the value-cost rationality dimension with sympathy-consent dimension. In the value-cost rationality dimension, price and exchange take place simultaneously with price (p) as determinant factor of exchange. The algorithm is market clearing equation, which equalize demand (D) and supply (S): D(p)=S(p). However, such story does not hold in the sympathy-consent dimension. It is haggling, bid/ask, auction, mark-up, administrated pricing as steps of sympathy-consent process that determine price.

In the value-cost rationality dimension, exchange transactions are determined definitively. There is no room for indeterminacy where exchange transaction may or may not take place. However, in the sympathy-consent dimension, exchange transactions may or may not happen,

the determination of chance for the occurrence relies on the sympathy-consent process. The indeterminateness is the unavoidable consequence of empiricist approach. The sympathy-consent dimension is the analytical space where the indeterminateness of exchange transaction is a distinctive attribute. The sympathy-consent process is the only navigator available for decision making.

Definition SCD (sympathy-consent dimension): The sympathy-consent dimension is the analytical space where decision makings remain indeterminate in between the cognitive systems of individuals. The sympathy-consent process is the only navigator available for decision making.

What Definition SCD means to indicate is that exchange transaction does not happen as a matter of course. Opportunistic behavior is the typical example of exchange failure. The possibility of opportunistic behavior creates the fear to decision makers and makes them to refrain from making decisions. It lays ground for the indeterminateness. The phenomena of indeterminacy was already witnessed by the Akerlof's lemon market (Akerlof 1970), although it was not recognized as the phenomena of sympathy-consent dimension. It was recognized as the problem of market failure.

However, the phenomena of indeterminateness as such are not restricted to market transactions only. The inability of rational agent model to recognize the indeterminateness should be attributed to their inability to recognize the exchange transaction in the market as the action of relation exchange. Market exchange is, in fact, the relation exchange which

makes use of the price as an instrument of exchange transaction. The exchanges of trust, friendship, affection, colleagueship, and even animosity are the examples of relation exchange off the territory of market exchange. Every relation exchange is attained through the communication process between and among different cognitive systems of different individuals, which is the sympathy-consent process (Rhee 2012b). If the sympathy-consent process becomes successful enough to make relation exchange, exchange transaction takes place. If not, relation exchange does not take place.

However, the sensory order of cognitive system begins with perception, which gives rise to intuition. Reasoning comes as last step (Kahneman 2003). In other words, reasoning or "ideas occur to us completely randomly, so that all our thoughts were 'loose and unconnected', we wouldn't be able to think coherently (T 1.1.4.1/10)" (SEP 2012).[7] As for the human mind's ability to associate certain ideas, Hume (1739) identified three principles of association: resemblance, contiguity in time and place, and causation. In other words, the sympathy-consent process is nothing but the open/indeterminate system.

The existence of the sympathy-consent process, which is of open/indeterminate system, is vindicated by the existence of the actions of relation exchange.

Proposition Existence SCD (the existence of sympathy-consent dimension): The sympathy-consent dimension as of open/indeterminate system does exist.

[7] SEP 2012 denotes Stanford Encyclopedia of Philosophy, 2012 edition. T 1.1.4.1/10 denotes Treaties book 1, part 1, section 1, 1-10.

Proof:

The sensory order of cognitive system of behavioral approach (Kahneman 2003) and Humean principles of associative ideas (Hume 1739) vindicate the open/indeterminate system of the sympathy-consent process. Since the actions of relation exchange are the facts of real life, the existence of sympathy-consent process is upheld by the legitimacy of empiricist approach. Again, the legitimacy of empiricist approach is buttressed by the reality of behavioral approach of economics and the epistemology of Hume who may be considered as the origin of behavioral approach.□

The implication, which Proposition Existence SCD extends, seems profound. The empiricist approach, which identifies relation exchange as the natural outgrowth of the sympathy-consent process, may consider market exchange as another version of relation exchange which uses price as medium of exchange (as is to turn out in the next section). Then, the open/indeterminateness of market exchange becomes revealed. Market exchange, as well as relation exchange, is not given at the outset. Akerlof (1970) considered lemon market as the feature of market failure because relation exchange didn't occur to his mind. Most of uncertainty problems of economics are nothing but the phenomena of sympathy-consent process which unfolds the open/indeterminate system. Market clearing system D(p) = S(p) (MCS in short) no longer holds to determine the exchange in the market. In empiricist approach, asset specificity (Williamson1971), metering problem (Alchian and Demsetz 1972), agency (Jensen and Meckling 1976), residual control rights (Grossman and Hart 1986),

indescribability of contract (Maskin and Tirole 1999a) and so on are merely the confession of difficulty in attempts to express the sympathy-consent process in value-cost measure.

Once we follow the empiricist approach, we are able to explain institution from the analysis. The rule of law, which is the typical example of institutional operation, ameliorates the fear of opportunistic behavior in the open/indeterminate system of sympathy-consent process and tends to increase (relation) exchange transaction (Rhee 2012d).

VI. Model of bounded rationality

Simon questioned the realistic efficacy of the rational agent model and raised the issue of bounded rationality (Simon 1955). However, no successful model of bounded rationality has been presented yet (Maskin and Tirole 1999a). What is the qualification to claim the entitlement? Firstly, the analytical architecture should be built on human cognition system which incorporates perception, intuition, and impression as the basis of human understanding and knowledge. It has to be distinguished from the rational agent model. In this regard, the empiricist approach, which was initially presented by Hume and his epistemology (Hume 1739) and propped up by behavioral approaches (Kahneman 2003), seems to fit for the condition.

Secondly, the model should be able to explain human actions of exchange. Rational agent model adopts the market clearing equation $D(p) = S(p)$ as the system to determine human actions of exchange. This system of market clearing equation (MCS: market clearing system), which is the root core element of Arrow-Debreu-MacKenzie model, contrasts with the sympathy-consent process of the economics of empiricism. What is *deus ex machina* to

determine price in the economics of empiricism? How the price is determined in the sympathy-consent process? Behavioral devices are haggling, auction, bid/ask, markup, and administered pricing. They are not directly related to MCS, which relies on equilibrium as solution algorithm. In fact, the behavioral devices of price determination as such are the partial components of sympathy-consent process, which determine price as the facilitator of exchange, not as the determiner.

In the economics of empiricism, relation exchange replaces MCS. Relation exchange takes place in as well as off the market. Since cognitive territories of individuals are separated from each other, relation exchanges are attained through the sympathy-consent process (Proposition RX-SCP). Every personal interaction is considered as relation exchange, which creates the division of labor. Every exchange in the market is also considered relation exchange. The only distinction between relation exchanges in and off the market is the role of price as instrument to facilitate transaction.

Thirdly, the relation between the model of bounded rationality and rational agent model should be accounted for. The premise of consistent measurement of value-cost indices is the linchpin which connects the two distinguished models. The fundamental difference between the model of bounded rationality and rational agent model stems from the recognition of human cognitive system. The model of bounded rationality is built on human cognitive system, the sensory order of which begins with perception, then impression (Hume 1739) and intuition (Kahneman 2003).

The cognitive system, which is built on sensory order, accounts for the lack of human intelligence necessary to support the premise of consistent measurement of value-cost indices.

Evidences are plenty. March and Shapira (1987) emphasized the role of illusions of control when "managers accept risks, in part, because they do not expect that they will have to bear them." When inside view of problem is conceived as anchoring on plans and on the most available scenarios, Kahneman and Lovallo (1993) reported an example of framing effects that the strong intuitive preference for the inside view as a source of errors of intuitive prediction that are both grave and unavoidable. Tversky and Kahneman (1983) reported the conjunction fallacy in probability judgment. People tend to choose intuitive reasoning rather than extensional reasoning like rules of probability. Experimental cases of mental accounting (Thaler 1985, 1999) and decision bracketing (Daniel Read et al., 1999) were reported.

Tversky and Kahneman (1974, p. 1124) concluded that "people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations., representativeness, availability, and anchoring." Prospect theory (Kahneman and Tversky 1979) reported the experiment unfolding the existence of reference point and the asymmetry of behavior toward loss aversion which is prompted by the reference point. The price of a set of goods is an extensional variable. However, "complete or almost complete neglect of extension has often been observed in studies of the willingness to pay for public goods" (William H. Desvousges et al. 1993). "List (2002) reported an experiment that confirmed, in a real market setting, violations of dominance that Hsee (1988) had previously reported in a hypothetical pricing task."[8] "Jonathan E. Alevy et al. (2003) also confirmed an important difference between the prices that people will pay when they see only one of the goods (separate evaluation), or

[8] Quotations are drawn from Kahneman (2003).

when they price both goods at the same time (joint evaluation).”[9]

What is unfolded by the studies of behavioral approach is the revelation of empiricist approach of economics which contrasts with the rational agent model.

Proposition Untenable Consistency (untenable consistency of measuring value-cost indices): Human cognitive system which begins with perceptions and ensuing sensory order repudiates the premise of consistent measuring of value-cost indices.

Proof:

What is vindicated by the studies of behavioral approach is that the extensional reasoning is not supported by the experiences of human behavior. What is unfolded by human cognitive system which begins with perceptions and ensuing sensory order is the attribute of path dependence of human cognizance. The attribute of path dependence of human cognizance renders untenable the premise of consistent measuring of value-cost indices.□

Proposition Untenable Consistency reaffirms the validity of Proposition Existence SCD. As the premise of consistent measuring of value-cost indices is rendered untenable by the nature of human cognitive system, the states, which are identified by human cognitive system, by

[9] Quotations are drawn from Kahneman (2003).

themselves belong to the open/indeterminate system. Since the sympathy is the conduit through which the communication takes place between and among open/indeterminate systems, the sympathy-consent process has to inherit the lineage identification as belonging to the open/indeterminate system.

Sympathy-consent process is open and indeterminate. Hence, relation exchange as the outcome of the sympathy-consent process is also open and indeterminate. This point is missing in the rational agent model of economics. Exchange transaction may or may not take place according to the outcome of sympathy-consent process. For instance, trust may attain exchange transaction. It may not attain exchange transaction due to the insufficiency. Trust is a mode of sympathy-consent process, which belongs to the open/indeterminate system. That is, it is not measurable by value-cost indices.

For the presentation of Proposition Fundamentality RX, the following definition should be put in order.

Definition SCF state (sympathy-consent-free state): Sympathy-consent-free state is defined to indicate the hypothetical states where sympathy and consent are obtained immediately without incurring any cost.

Sympathy and consent processes are in general arduous work, requiring cost and time. It belongs to the open/indeterminate system. Assuming SCF state is unrealistic. However, in order to find the linking chain which connects sympathy-consent process and premise of

consistent value-cost indices, putting the definition SCF state in place is necessary step.

Proposition Fundamentality RX (the fundamentality of relation exchange): Relation exchange is more fundamental than market exchange with price used as means of exchange.[10]

Proof:

The proof of the fundamentality of relation exchange requires two steps. Firstly, the analytical space of relation exchange has to be shown to include the analytical space of market exchange with price. Secondly, it has to be shown that the analytical space of relation exchange is not included by the analytical space of market exchange with price.

As a preparatory step proof, we should remind that the analytical space of relation exchange is built on the sympathy-consent dimension, which belongs to the open/indeterminate system. On the other hand, the market exchange with price is built on the premise of consistent measuring of value-cost indices, which gives rise to the closed/determinate system.

[10] There are other ways to prove the fundamentality of relation exchange over value exchange. First proof was provided in Rhee (2012b) by means of path dependence as idiosyncratic attribute of relation exchange. Path dependence is the congenital outcome of behavioral and empiricist approaches. Hume underscored it in the discussion of probability in his book (1739, Part III Of knowledge and probability). A mathematical proof of this proposition is provided in forthcoming paper which to be presented in 2017 Summer Conference of Korea Academic Society of Industrial Organization on August 24, 2017. The mathematical proof, which is built on the open set property of open/indeterminate system, is quite in parallel with the logic of this paper.

For the proof of the first step, the sympathy-consent dimension is compared with the analytical space of market exchange with price. The former belongs to the open/indeterminate system, whereas the latter belongs to the closed/determinate system. The analytical space which is extended by the premise of consistent measuring of value-cost indices belongs to the analytical space of SCF (sympathy-consent-free) state.[11] SCF states are a subset of the sympathy-consent dimension. Hence, the analytical space of relation exchange contains the analytical space of market exchange with price.

The proof of the second step comes off from the reasoning steps of the first proof. The analytical space which is extended by the premise of consistent measuring of value-cost indices belongs to the analytical space of SCF (sympathy-consent-free) state. SCF states are a subset of the sympathy-consent dimension. Hence, the analytical space of relation exchange is not contained by the analytical space of market exchange with price.□

Proposition Fundamentality RX reaffirms the validity of Lemma FRX in Rhee (2012b). The meaning of Proposition Fundamentality RX is profound. Most of all, it indicates the legitimacy of the empiricist approach of economics. The empiricist approach is nothing but the model of bounded rationality. It also indicates the legitimacy of open/indeterminate

[11] While explaining 'chain of reasoning' to draw out inductive inference, Hume (EHU 4.2.16/34) mentioned the circularity in the reasoning, which is called uniformity principle. This uniformity principle seems analogous to SCF state. In this connection, Bayesian interpretations (Binmore 2011) are different from behavioral approaches, and seem also digressed from Hume's intentions about the causation principles.

system.

VII. Ramifications of nascent empiricist approach

What changes to economics by the modeling of bounded rationality or the introduction of empiricist approach? Most distinctive change is that it is not MCS, but the sympathy-consent process that determines (relation) exchange transaction. Exchanges in the market should be understood as relation exchange which is attained through the sympathy-consent process. Akerlof (1970) considered used car or senior health insurance market as the cases of market failure because it was MCS, i.e. $D(p) = S(p)$ as the algorithm that is considered to determine the exchange transaction.

However, in the economics of empiricism, where individuals are bounded-rational, relation exchange replaces the exchange in the market. The sympathy-consent process determines relation exchange transaction, which belongs to the open/indeterminate system. It is haggling, bid/ask, auction, markup, and administered pricing that determine the pricing. These pricing systems also are parts of the sympathy-consent process.

Corollary PD of Pricing (the path dependence of pricing): In the sympathy-consent dimension, the pricing becomes path dependent.

Proof:

In the sympathy-consent dimension, it is relation exchange that determines exchange transaction. Relation exchange is determined as the outcome of sympathy-consent process. Hence, the sympathy-consent process affects the pricing process of transaction.□

In real life, the instances of path dependence of pricing are often times witnessed. Every exchange transaction scheme, such as haggling, bid/ask, auction, markup, administered pricing, makes reference to previous closing price as reference point. Price downward rigidity is the general phenomena, which are not isolated to the wage determination of labor market.

Corollary Exchange Indeterminateness (the exchange indeterminateness): In the sympathy-consent dimension, the exchange transaction remains indeterminate.

Proof:

In the sympathy-consent dimension, it is relation exchange that determines exchange transaction. Relation exchange is determined as the outcome of sympathy-consent process. The sympathy-consent process belongs to the open/indeterminate system. Hence, the (relation) exchange transaction becomes indeterminate.□

The idiosyncratic point of empiricist economics is the indeterminateness of (relation)

exchange transaction. Exchange transaction may or may not happen. It is indeterminate. If any fear looms, the exchange activity dwindles. It is the cognitive system of human beings. It is the real feature of the sympathy-consent process. In this model of bounded rationality or empiricist approach, Akerlof's lemon markets are not exceptional cases of market failure, but are considered as the general features of sympathy-consent process. The (relation) exchange indeterminateness puts in place the theoretical domain which ushers in the roles of institution and entrepreneurship.

Remark Legitimacy of Institution: In the sympathy-consent dimension, the building of institution affects the possibility to attain the exchange transaction.

Proof:

The sympathy-consent process is the open/indeterminate system (Proposition SCP-OIS). Since the institution influences on the actions of relation exchange, it affects the attainment of exchange transaction.□

Since Ronald Coase (1937, 1960), the studies of new institutional economics attempted to explain the legitimacy of institution. However, their attempts remain only incomplete because their analytics still remain in the domain of closed/determinate system. The legitimacy of institution becomes completely upheld by the empiricist approach of economics (see also

Hume 1751). Now, we understand how the institution is related to exchange transactions and market operation through our understanding of its effect on the actions of relation exchange.[12]

Remark Legitimacy of Entrepreneurship: In the sympathy-consent dimension, the appearance of entrepreneurship affects the possibility to attain the exchange transaction.

Proof:

From Corollary PD of Pricing, the pricing is recognized as a part of sympathy-consent process. The sympathy-consent process is the open/indeterminate system (Proposition SCP-OIS). If business model is defined as the strategic action to combine the actions of relation exchange with pricing policy, the entrepreneurship is able to be recognized on the definition of business models, which vindicates the legitimacy of entrepreneurship□.

Although the history of entrepreneurship is long since its introduction by Schumpeter (1934),

[12] Examples are plenty. Marketing activity increases the possibility of exchange transaction. In international trade theory, Ricardian table of comparative advantage turns out to mislead the trade theory. Neoclassical interpretation attempt to draw the gains from trade from cost advantage. However, international trade is the typical example of open/indeterminate system. The fear of opportunistic behavior of trading partner restrains the business spirit of exporters. The establishment of GATT/WTO principles, e.g. principles of non-discrimination and market access, ameliorates the fear and prompted the lift-off of trade volumes during the period after the WWII.

it is another case which has been incompletely recognized (Kirzner 1973), if not ignored, by rational agent model. Again, the closed/indeterminate system was the reason to blame. The open/indeterminate system of nascent empiricist approach seems to provide the analytical underpinning for the legitimacy of entrepreneurship.

Remark OB-RX (organizational behavior as the actions of relation exchange): Organizational behavior is recognized as the actions of relation exchange.

Proof:

Organization is no more than the units of relation exchange. Hence, organizational behavior is synonymous with the actions of relation exchange.□

Since Simon (1957a, 1957b, 1984, 1991) raised the issues of bounded rationality and organizational behavior, these two have been the enigma which remains unresolved because economics has been unsuccessful to build the model of bounded rationality (Maskin and Tirole 1999a; Tirole 1999). The empiricist approach (Rhee 2012b, 2016b) seems to shed illumination on the question of organizational behavior. Relation exchange is the fundamental propensity of human beings (Rhee 2012b) whose cognitive system begins with the experiences of perception (Kahneman 2003; Hume 1739). The actions of relation exchange provide the model of bounded rationality and explain the organizational behavior of human

beings (Rhee 2012b, 2016c).

VIII. Concluding remarks

Empiricist approach begins with the cognitive system of human understanding. The first step of human cognition is the perception, which comes off as the outcome of experience (Hume 1739; Kahneman 2003). Impression comes from perception (Hume 1739, 1751). Intuition is fast and effortless process in the cognitive structure (Shelly Chaiken and Yaacov Trope 1999; Gilbert 2002; Steve A. Sloman 2002; Keith E. Stanovich and Richard F. West 2002). Reasoning, however, is slow, serial, controlled and effortful process in the cognitive scheme (Stanovich and West 2000). Ideas are built from repeated conjunction of impression (copy principle; Hume 1739). According to Hume (1739), "all the objects of human reason or enquiry" are divided into either relations of ideas or matters of facts. In other words, the causation or reasoning is subject to the sensory order which begins with perception. The empiricist approach of economics is built on the cognitive scheme of either behavioral economics (Kahneman 2003) or Humean epistemology (Hume 1739).

On the other hand, the rational agent model of economics is built on the premise of consistent measuring of value-cost indices, which may be illustrated by transitivity, reflexivity, and completeness of preference ordering. The closed/determinate system is defined to denote economic states which are extended by the optimization-equilibrium algorithm upon the assumption of the premise of consistent measuring of value-cost indices.

The fundamental difference between empiricist approach and rational agent model arises from the cognitive system of human beings. Upon the encountering the challenge of decision

making, the assessment of extensional variables such as logical reasoning is not likely to be supported by the intuitive responses of human cognitive scheme which tends to substitute an attribute of the proto-type for the extensional attribute (Michael I. Posner and Stephen W. Keele 1968; Eleanor Rosch and Caroly B. Mervis 1975). In other word, the premise of consistent measuring of value-cost indices is not supported by the experiments of behavioral studies. The economics of behavioral approach or Humean epistemology belongs to the open/indeterminate system.

In empiricist approach where the cognitive system of individuals begins with perception, how the interpersonal interactions among individuals have to be perceived? According to the rational agent model, interpersonal interactions are recognized only in the market exchange with the price used as the medium of exchange. Most serious doubt to this direction of approach was raised by the case of market failure (Akerlof 1970). It was a mistake to blame the information asymmetry for market failure and restricted the market failure as exceptional cases. It is congenital problem to the approach which attempted to rule out all the human interactions to restrict our attention only to the cases of market exchange. Most serious problem of rational agent model is its inability to recognize the cases of indeterminateness of exchange actions. Wavering is common and natural action of human beings. In most of human action, the dividing line between action and inaction is blurred by wavering. The interaction between or among individuals is that of cognitive systems of different individuals. It is the intellectual interactions in the condition of bounded rationality. It was called the territory of sympathy by David Hume (1739, 1751) and Adam Smith (1759). Public choice school (Buchanan and Tullock (1962) introduced the concept of public consent to express the difficulty to attain it.

The sympathy-consent process is the interpersonal interactive process at the interface of different cognitive systems of different individuals. The sympathy-consent process stands for human behavior in the condition of bounded rationality. The existential reality of sympathy-consent process is vindicated by the actions of relation exchange between and among individuals. Every interpersonal interaction is the action of relation exchange. Every relation exchange gives rise to the division of labor, which creates welfare and productivity. Relation exchange includes non-market as well as market exchanges.

When we perceive the actions of exchange as the actions of relation exchange, it indicates to recognize the sympathy-consent process as analytical dimension. Since market exchange actions may be perceived either as the actions of value exchange or that of relation exchange, there comes the problem of fundamentality between two approaches in cases of market exchange. The fundamentality of sympathy-consent process vis-à-vis market clearing is straightforward in the vindication. The sympathy-consent process belongs to the open/indeterminate system. On the other hand, value exchange in the market belongs to the closed/determinate system. Closed/determinate system is an extreme case of open/indeterminate system where the property of consistent measuring of value-cost indices pertains on.

If market exchange is considered as relation exchange where the sympathy-consent process replaces the position of market clearing system $D(p)=S(p)$, then how to conceive the price and its role in the sympathy-consent process? Price is a part of sympathy-consent process, the determination of which is carried out from haggling, auction, bid/offer, markup, administered pricing.

Distinctive attribute of sympathy-consent process is path dependence, which is the idiosyncratic attribute of empiricist approach. Experiences leave effects to entailing process. Consequently, the price determination becomes path dependent, which critically distinguishes empiricist approach from the analysis of rational agent model. The empiricist approach of economics lays a meaningful landmark by setting out the analytical model of bounded rationality. Empiricist cognitive system upholds the analytical architecture of analytical model, which is built on the sympathy-consent dimension, and encompasses the analytical structure of rational agent model as extreme case.

Empiricist approach of economics is not an alternative approach, but the general approach which uses the extended dimension of analytics in comparison with rational agent model. It includes not only market exchange actions but also non-market interpersonal interactions which are conceived as the actions of relation exchange. Its merits are most of all the ability to explain the wavering actions of decision making. In the similar vein, institution becomes able to be explained. At the same time, entrepreneurship is able to be understood in the analytics of empiricist approach.

Problems of new institutional economics like agency, information asymmetry, puzzles of firm theory, metering problem, incomplete contract theory, adverse selection, moral hazard can find way out for resolution.

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