The Birth of a Unified Economics

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15 March 2020

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An Introduction to the Algorithm Framework Theory

Abstract: The paper outlines an original thinking theory and its applications to economics. The author ascribes the flaws and divisiveness of economics mainly to the lack of a proper theory on how a person thinks. Human thoughts shall be entities, and thinking shall be behaviors, both featuring spatiotemporal. Simulating a computer, human thinking can be Kantianly and dually interpreted as computational operations which mean that Instructions, as the innate and general thinking tools, process information or data selectively, serially, and "roundaboutly". Conditioning with operational speed, time, space and computing economy, the architecture reasonably leads to the results of knowledge stocks, Combinatorial Explosions, subjectivities, pluralities, conflicts, innovations, developments, "Semi-internalization", convergences, divergences, "High-order Consistency", etc., and hence a great deal of theoretical socio-economic puzzles are basically solved, including institution, organization, money, capital, Invisible Hand, business cycle, crisis, power, government, etc. This explosive framework could be a decisive breakthrough and a deconstruction of the mainstream equilibrium paradigm, and hence a grand synthesis or unification and a new comprehensive research program of economics.

Key Words

economics; economic methodology; social science; theory; time

JEL Codes

A10 B00 Z10

I. Introduction

Theories dominate economics. The mainstream economic theory is the Neoclassical theory, which faces many serious difficulties in explaining the real economy, such as dynamics, knowledges [1] (human capital), institutions, organizations, innovations, money, growth & developments, business cycles, crises, governments, public policies and so on. These issues constitute serious challenges. Neoclassical theory seems to explain some primary and simple economic phenomena (e.g. prices), and its defects are tried to be remedied by many other non-mainstream theories. However, up to now, mainstream and non-mainstream theories have not been effectively unified; besides, many non-mainstream theories (e.g. Behavioral Economics) have, reversely, lost some of the mainstream merits, such as the "rational principle" and analytical rigor, thus their criticism on mainstream is allegedly not important. In aspect of depicting and analyzing the real world, economics is obviously in a state of dissatisfaction, failing to meet the expectations of the public.

What are the reasons? The author finds out that the above difficulties are mainly due to a single reason, that is, the lack of a proper thinking theory. We by far do not know how people think. Most of the existing theories are ambiguous. Illustratively, "thinking means processing information" is literally acceptable, but what is processing information? How is information processed? It shall be noticed that the above issues are mainly concerned with thoughts, the thinking processes or their consequences. For example, knowledges and institutions are just some forms of thought. Innovation means that old thoughts are replaced by new thoughts. Since money could be deemed the symbols or credentials of some agreements, the "agreement" is definitely a kind of thought. Moreover, the mainstream economic theory loses its dynamic natures, obviously because it fails to depict "thinking" as a real kind of behavior, process, flow or activity; On the contrary, it implicitly presumes infinite thinking speed, or zero thinking time, which could be regarded as the lump-sum cause of its various failures. Therefore, a challenge faced by economic theories shall be to treat human minds as some relatively independent "entities" or "objects" and to place them in a framework where thoughtful and physical objects coexist and interact with each others. Although actors are usually supposed by economists to make decisions through thinking activities, "thoughts" or "thinking" have not been clearly treated in such a way, which the paper proposes as a new and primary methodological principle.

Nevertheless, why a thinking theory has been absent are quite comprehensible. Thoughts as objects are not easy to capture and "observe". As a model of human brain, computers did not appear until the middle of the 20th century. Since then, according to the author's opinion, some detours have been unfortunately made. At the beginning of this century, the author realized that the principles of computer can be reinterpreted as the Kantian dualism of "transcendence + experience", or "apriority + posteriority", where the concept "Instruction" refers to some of the most basic forms, tools or steps of thinking, which can be regarded as the embodiment or ideal form of "transcendental thinking tools" in philosophy. Instructions are sent by human users to a computer, thus they reflect the basic thinking mode of human brain – what the computer does is only to encode the Instructions

[1] Since it treats "knowledge" pluralistically and discretely, the paper, unconventionally, uses the plural form of the word.

and runs them quicker. Core Instructions amount to dozens only, and identical to everybody, which are used selectively to process information; Only one instruction is allowed to run at a moment, processing no more than 2 data and getting no more than 1 result. In order to carry out a task, enormous Instructions usually have to be compiled and then executed one by one sequentially. This means the Roundabout Method of Production of thoughts, which both requires and generates knowledge stocks, then initiating the historic marches of knowledge development. However, the objective world keeps changing, requiring the actors to make decisions from time to time, and hence the actors have to decide during the halfway of cognition; Consequently, they fall into various subjectivities frequently. Through micro analyses of computing, we can realize that even all kinds of subjective methods are nothing more than some combinations of various basic thinking operations i.e. the Instructions, which are selected and weaved according to their functions and computing economy -- just like the input decision-making for commodity production. This shall be the secret of the so-called "irrationality". Subjective computations provide the possibilities of error correction, and hence innovations. Computations mean the making of permutations and combinations between Instructions and information, which leads to the "Combinatorial Explosions", hinting that knowledge development is similar to the universal "Big Bang", and the space for innovations is infinite, so equilibria can only exist locally; convergent processes blend with divergent processes, and the computational vitality will not decline in general. Thus, while absorbing the essence of mainstream theory, we could decisively break through the equilibrium paradigm and enter into a pluralistic, mixed, conflictive and developing system.

In the "flow-stock" roundabout architecture, knowledge stocks are relatively "dead", insensitive or purblind to the volatility of current operations, where we can uniquely find the nature of institutions as a kind of knowledge stock. Conflicts pervade both ex ante and ex post, hence it would be, with some conditions, profitable to build up interpersonal coordination. However, limited knowledges make it impossible to always establish ex ante an institution to achieve the coordination, thereby a real-time person-to-person command system has to be adopted at the workplace, which refers to the concept of "organization". In the context of numerous institutions, organizations and freelancers, economic activities can only be carried out respectively in local fields, characterized by the use of money, or closely related to money. Money comes originally from the motivation of saving computing costs of price conversions, and then, due to the interpersonal trust problem aroused spatiotemporally, it has to be "held in hand" in order to pay on the spots of transactions. Transactional opportunities need to be discovered, and transactional means need to be cultivated. Accordingly, what prices express are only limited, despite prices are often more prominent, sensitive and incentive than other kind of information. The economic and social order is maintained mainly by obedience of knowledge stocks, thereby innovations and developments happening only marginally. The symbiotic independent individuals in large number foster vast concurrent but different knowledge researches and developments, where they can often learn from one another. Successes and failures thus occur frequently at the micro level, but their mutual offsets lead to the relatively stable performance of macro-economy. The latter, mainly as a kind of externality, is originally caused by Bounded Rationality of common actors, but then re-internalized by the "macro actors" (i.e. governments), thus the economy becoming a mixture of "intentional" and "unintentional". However, from the perspective of "Algorithmically" Bounded Rationality, although successive growth is often strikingly achieved, it is reasonably impossible to entirely

eliminate business cycles and crises; In the long run, all arrangements, whether institutional or not, will probably evolve, synchronously or asynchronously.

The above thinking theory is called "Algorithm Framework Theory" (hereinafter referred to as "AFT"); the new unified economics based on this theory and its inferences is called "Algorithmic Economics". This new economics will, integrated with the new "Algorithmic" discoveries, critically synthesize all the existing schools of economics, so as to in principle explain the real world wholly. Some of its "highlights" are listed above. However, since most of Algorithmic narratives are unprecedented and considered subversive, the author highly recommends readers to read the full text. As a summarized introduction, this paper will start with explication of the 15-years-old theory (Chapter II), then expound its inferences, extensions and applications (Chapter III). The unification of economics will be interpreted in terms of schools, branches and methodological issues (Chapter IV) before it reaches supplementary conclusion (Chapter V). Algorithmic Economics does not strengthen the current highly technical, i.e. mathematically-based, characteristics of economic theory; instead, it is committed to reviving the traditional humanistic and thoughtful genres of economics. Therefore, readers who are not familiar with computer science can still understand and grasp it. For the emergent "computational economics", Algorithmic Principles can be used to revamp the method of programming simulation, and then to advocate it to supersede mathematics as the new platform of formalization. In a word, this paper is devoted to a creative and comprehensive research program.

II. Algorithmic Framework Theory

2.1 "Instruction + information"

How is a thinking activity carried out? The answer lies at the Algorithmic Framework Theory: when a person thinks, a number of "Instructions", as the innate thinking tools in the brain, selectively, serially and repetitively process information (or data) from the outside world. The type and number of Instructions are identical to everyone. Only one Instruction can be run at any moment, processing no more than two data and resulting in no more than one datum; this is called one operation. Another operation, if any, has to be done subsequently or at another moment ("Serial Processing"). Only a finite number of operations can be undertaken in a unit time.

Readers must have perceived that this is an answer of "computationalism" -- that is, to treat a human brain as a computer, to call thinking activities as "computing" (or "computations"), and thus a series of computer terms are borrowed. As computationalism has existed for a long time, why is it raised herein again? The reason is that the concept of "Instruction" has been almost completely ignored in the previous literature, so that in my opinion, computationalism has been seriously misguided. In turn, by re-establishing the dual structure of "Instruction + information" mentioned above, a large number of important inferences can be drawn out, and then all the goals listed in Chapter I would be achieved.

Some readers may immediately question: as a human brain is obviously different from a computer, how can we equate the two? This pertains to the meaning of the concept of "Instruction". "Instruction" refers to the category of basic jobs or tasks that can be performed by a computer. Each

computer has been equipped with an Instruction system before leaving the factory. The Instruction systems of different computers are different more or less, but most of the core Instructions of an Instruction system remain the same, and the number of them is only dozens. Any task cannot be undertaken by a computer until it is decomposed and translated into the combinations of Instructions (or operations). For economists, the word "Instruction" may sound strange and obscure, but its content is actually quite simple. For instance, 7+5=12, "＋" (or "Add") is the Instruction, 7 and 5 are the data (or information), and 12 is the resulted "knowledge". "Add", "Subtract", "Multiply", "Compare", "And", "Or", "Not", "Input", "Copy", "Transfer", "Move", "Store", "Loop", "Return" and "Halt" are respectively some examples of Instructions. The arithmetic Instructions (e.g. "Add", "Subtract", "Multiply") and functional Instructions (e.g. "Input", "Copy", "Transfer", "Move", "Store") are easy to understand. A great leap in the history of computer development lies in the realization of logical operations (e.g. "And", "Or", "Not") on computer. It is based on a discipline called "mathematical logics", which transforms logical inferences into symbolic operations, thereafter they can be performed in the way comparably to arithmetic operations. Based on the discipline, a computer is able to automatically "reason", and its applications were greatly expanded.

However, a computer is just a machine with high and low electric-potential and electric-current inside, it really does "know" neither what computed nor what "computation" means. No matter Instructions or information, they are all the permutations and combinations of 0 and 1 as software coding, and are just transformed into electronic signals in the computer. Although there are many complicated skills for computing, when analyzed in details, they are quite understandable (even "clumsy") to common readers. The reason why people use computers is actually to make use of their rapidity. That is to say, what information is, what Instruction is, what computation is, what computational results mean, all of which shall be defined, interpreted, understood and evaluated only by human users. Particularly, the initial meaning of the word "Instruction" referred to the instruction a user gave a computer to "execute" -- which was otherwise to be done by the user oneself. Later, the meaning of the word changed, and became the kind of the job that the computer can undertake and hence provide for users to choose. "What you give is what you have." In other words, Instructions, information and computations are all human's own businesses, which could be deemed reflections of the structures, functions and mode of a human brain. Computer scientists themselves, as mankind, certainly had the same architectures in their brains, hence they built up the computer primarily as a copy of, and an assistant to, their brains. The more computers and Artificial Intelligence Engineering (hereinafter referred to as "AI") develops, the stronger they evidence AFT.

It is absolutely certain that a computer has simulated at least some parts of a human brain. The optimism about AI can even lead us to believe that computers have likely simulated most of the thinking activities, especially those so-called "rational" parts. One of the doubts concerned is whether AI can simulate complete human thinking. In order to remedy the weakness, it is auxiliarily assumed that: There are some basic kinds of thinking jobs or functions in a human brain that a computer is currently unable to simulate, but they are still performed in the way of "Instruction + information", so can be called "Artificial Instructions". The author hopes that this hypothesis could conciliate those skeptical readers, so that they accept to continue reading the paper.

2.2 Instruction is the pivot

Among the new concepts introduced by AFT, "Instruction" lies at the core. The advantages and benefits of Instructions would be, the author dares to say, uncountable, hereinafter just some of them enumerated.

First, Instruction is an innate thinking tool, simple and apparent, which can be used to match the concept of "information". What are the tools for information-processing? Now the answer becomes clear; "information" thus is saved from the awkward situation of "singleness", or "hopping on one foot". Males and females are interdependent and mutually defined, so it would be puzzling that there is only one gender and no the other. Similarly, without Instructions, the concept of information has been deluging, but superficial and ambiguous. As the question "what is not information" cannot be reasonably answered, why information becomes something else after it is input into the brain cannot be reasonably explained either. Human thoughts are based on experiences or information, but then the latter become beyond experiences or information and turn subjective. This "subjective turn", even if not ubiquitous, happens quite often. If we only say that "thinking means the interactions among information", it is obviously not enough. We must point out what kinds of interactions they do; a kind of the "interaction" can be an Instruction.

Secondly, Instructions are one by one, separate or discrete, each of them can play a computational role independently, thus can be deemed the concept of "minimal unit of thinking" and hence favored for "permutation-and-combination" method. In the past, the philosophy of Platonism took knowledges as static and absolute, and as a whole system, resulting in impossibility of innovations or knowledge-development. It can be argued that Plato's Idealism actually confuses the difference between knowledges and Instructions. What the human brain innately possesses is primarily not knowledges, but Instructions. Knowledges shall be the "products" produced by integration of Instructions and information. The Instruction system always remains the same, but knowledges change and grow. Instructions process different information, outputting different knowledges; even if the original information processed remains unchanged, new knowledges may be generated as long as the Instructions used change or the processing queue changes. The development space of knowledges shall be infinite. If we think these common senses are correct, AFT can be a very concise and effective way to demonstrate them. Furthermore, we can thus perceive why some popular ideas could be wrong. For example, behavioral economists insist that human beings have many inborn tendencies, preferences or characteristics, which often lead to "abnormalities" or "biases" from the standard theory. However, if we can prove that those "rational thinking" and postnatal behaviors will reasonably cause phenomena similar to these "abnormalities" or "biases", what would happen both to behavioral and mainstream economics? Wouldn't the impacts be revolutionary?

Thirdly, the introduction of Instruction "naturally" and concurrently introduces the factors of time and space into economic theories. Instructions exist inside the human brain, information exists outside the brain. Once information is input into the brain, it integrates with Instructions and initiates the "thinking behaviors". Without the positional movements, there would be neither thinking behaviors nor thinking time. Thinking behaviors proceed while the social and physical world changes, thus a comprehensive and interactive theoretical framework forms up, and the performances of the whole world can be explained thereof. A real problem faced by the actors is that they must think and decide synchronously with changes of the outside objects, rather than wishfully

"suspend" their changes so that they can make decisions easier. The actors usually have to coarsely make decisions under the pressure of limited knowledges and limited thinking time, which results in subjective, irrational and uncertain decisions. This shall be the secret why "irrationalities" happen. Moreover, failure to attach time to human thinking is apparently the reason why mainstream economic theory loses dynamics. For social scientists, the most important changes shall be the changes of human minds, rather than the changes of the objective world while human minds are assumed always staying at the best level from beginning of the history. In fact, thinking behaviors shall be the core objects of social sciences, because everything such as institutions, money, technologies, wealth, organizations and public policies are all "thoughtful", or closely related to thoughts. Once human thinking are attached with the spatiotemporal characteristics, the philosophy of "thoughts as objects and entities" mentioned above shall be naturally realized, needless of deliberate emphasis.

Fourth, Instructions are software, they are thoughts themselves, everyone can "sense", perceive, understand, grasp, control and use them – despite their unusual title "Instruction". Researchers used to attempt to reveal the mystery of human intelligence through study of the physical and biological features of human brains; this shall be a way of detour, wasting much more. Study of intelligence still depends on intelligence itself; when researchers studying, they can feel and know what they think. As computer science helps to decompose the structure and process of thinking into "Instructions + information", so that researchers can understand their own thinking more clearly. Since the actors are controlling their own thinking behaviors and can recall and speak out their own thinking processes to a large extent, why do researchers, on the contrary, rely on physical objects than directly on the minds? The below will explain that those desirable socio-economic principles can be established just by the "software means", which refines the merits of Information Technology while avoiding technological complications, and thus reviving traditional humanistic genres of economics. Readers might agree that this is a shortcut.

2.3 How a person thinks

Instructions can be taken as the thinking tools stored in the brain, or the categories of actions that a "thinking organ" in the brain can (and only) do. The two ways of understanding effect similarly. Just as those in a computer, it can be supposed that after information or data are input into the brain, they are "placed" in one (or two) specific position(s) of an Instruction (thus the Instruction will become "complete" from "empty", like a machine is filled by uploading raw materials into its entrances), and then an action is operated (or "run", "executed", etc.); that is, an "operation" is done to get an result; the result is usually stored in a place called "Temporary Storage", subject to being recalled later by subsequent operations; If not recalled, it will be deleted or transferred into a place called "Long-term Storage", subject to being recalled in the long term. If the result is a "decision" requiring to be physically executed, the Instructions that are specified to control locomotive organs (e.g. the limbs) will be run to "command" to launch physical and external "actions" that are usually visible to outside observers.

The above is the processes of thinking described by AFT. The processes primarily interpret the so-called "rational thinking", which is conscious -- that is, the actor himself can feel, perceive, control, recite, and repeat it. According to relevant literature, there may be some unconscious "automatic thinking" in human brains, which can further be regarded as an extension of conscious

thinking, therefore can be technically ignored, and hence our focus can remain temporarily on consciousness. We will return it later. According to other literature, it is possible that multiple operations can be run at the same time (i.e. the "Parallel Processing"). However, the above mode of Serial Processing is more in line with our common senses and intuitions, and Parallel Processing can also be reduced into a combination of multiple serial processes, hence it is reasonable to regard the serial mode as the core and fundamental method. We will prove later that in the "ocean" of the brain, the "rational thinking" could be deemed the leader.

The operations cost energy and other resources, so they are fit in economic analyses. In order to save, the computational results usually need to be saved and re-used as much as possible, so as to avoid repeating the previous operations. The original information also needs to be stored so as not to be collected again. Nevertheless, memorization of any datum occupies the space of storages in the brain, the "Store" (or "Memorize") itself can be an Instruction as well, and its execution also costs. As the data in the Long-term Storage are biologically stored, they need to be "maintained" occasionally, otherwise will decay. Thus a person has to timely weigh up storing and deleting data, rather than indiscriminately storing any data. However, this "forgetting" effect is just relatively minor and can be ignored in many cases.

Reasoned with above logics, a large number of data, whether as original information or as computational results, will be naturally and inevitably accumulated over time, thus data stocks will keep growing. Since the data in a computer amounts very large, often hundreds of billions of bytes, it can be conjectured that the size of data stocks of mankind must be amazingly large as well. As there are no more than two data processed for one operation, that is to say, the operational ability is very weak, so it is necessary to maintain a large number of previous results, so as to effectively assist the current operations which have to be done instantly on the spot to solve the problems above one's head, therefore can be called the "Current Operations" or "Spot Operations". This "store-then-recall" method can be called "Roundabout Production Method", which, depicting a substitutive relationship between time and space, was originally proposed by Eugen Von Bohnbawark, an Austrian economist, to refer to physical commodity production in a factory[2], now it can be analogously used to refer to human thinking.

A novice studying computer principles might be confused with some of the above statements. For example, what mechanism leads to the jobs, such as input, operations, storing and output, etc., done in an orderly manner? Is there any mysterious "hands" reining all of them? The answer is No. Computer science suggests that there are fundamentally only such arrangements for computing, which are actually enough to endogenize the common thinking activities that we often observe or experience. The main reason for the order and effectiveness of computations is nothing but the data stocks which, as the results of previous computations, and often as the high-quality results selectively imported from predecessors and others, or as those filtered, condensed and refined by oneselves, will "tell" the actors what shall be done to carry out relevant computations, e.g. what Instructions shall be selected and used, what data should be called, what original information shall be collected, how much the parameters shall be valued, and what shall be done next, etc.. Different stocks of data play different roles. A Program, as a major kind of data stock, refers to a series of Instructions arranged together in a certain order, thus functioning more powerfully than those separate Instructions.

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[2] Eugen von Böhm-Bawerk (1891), Chapter II Book I.

The rest of computational details, in principle, are assumed to be similar to those in a computer, and novices could technically ignore them.

Since computations cost time, data stocks have to develop historically from less to more, from low quality to high quality. Thus, the order and the effectiveness of them must be limited. Low level stocks effect low, and high level stocks effect high. Therefore, it can be inferred that computations will become ignorant or blind from time to time, when the actors may give up or randomize their computations, or the operations would be messy or chaotic more or less – in fact, our real persons often experience such mental state. The operations without any stock support can be called "Pure Simple Operations", which are undertaken in a completely passive and stochastic way, responding haphazardly to impacts.

However, the category of Instructions and the quantity of data stocks are all limited. Human thinking means the activities of adopting these limited resources, then weaving them in a certain order & manner so as to process the information from outside, or to answer some (thoughtful or practical) questions. We call the method of weaving Instructions and data the "Algorithm", which lies at the core of one's intelligence; so we call the theory introduced in this chapter the "Algorithmic Framework Theory" (or "Algorithmic Theory", or "Algorithmic Framework"). Accordingly, a person who adopts this way of thinking can be called the "Algorithmic Person". AFT implies that the actors in the real world can be defined as Algorithmic Persons, thus we get the "Algorithmic World". AFT and its consequences are totally called "Algorithmic Principles". The methods based on AFT are called "Algorithmic Methods". The word "Algorithmic(al)" refers respectively to "of Algorithmic Theory", "of Algorithmic World", "of Algorithmic Principles" or "of Algorithmic Methods" in accordance with the contexts.

III. The Consequences and Extensions: Formation of a Series of New Principles

It shall be an arduous but important task to reveal the secrets of thinking. In terms of this task, AFT is just a very simple theory. However, as a Chinese saying, "a journey of a thousand miles begins with one step". The author does not expect that AFT is perfect and impeccable, but that it is useful and improving to the current economics. For readers who are familiar with the principles of computer, given that the above content is close to a recitation of textbooks, the usefulness of AFT might be doubtful. The goal of this chapter is to eliminate the doubt.

Due to limited space, we will not discuss the detailed processes of Algorithmic thinking; that is, we will, for the time being, not analyze how each operation is constituted by the form of "Instruction + information", which is subject to the technical Algorithmic branch. The technical branch apparently relates to the existing "Computational Economics", which aims to develop software programs that can run directly on computers. Ahead of programming simulation, the priority step shall be to establish or to reform theoretical principles. Economics currently suffers the principle problems so heavily that technical researches have to be relegated to the secondary position. Now, let us take a leap and, as economists traditionally and "manually" did, reason deductively to see what would happen Algorithmically to the principles of economics. Although most of these consequences and extensions seem philosophical, they are actually very important to economics.

3.1 The "Combinatorial Explosions" and infinite developments

Thinking activities, viewed Algorithmically, now become processes of "collisions", "reactions" and "combinations" between Instructions and information, quite similar to chemistry. In mathematical terms, computation means the "permutations and combinations" between Instructions and information. A computational operation is a "permutation" (formatted sequentially) or "combination" (formatted without sequence) between one Instruction and two, one, or zero data or datum. Mathematical knowledge tells that the number of permutations and combinations that can be made between a limited number of Instructions and a limited number of data is usually very large, far exceeding the number of Instructions and data themselves. Considering the operational results can be re-input as data again for computations, the permutations and combinations available will increase much more, even infinitely. Computer scientists have discovered the "secret" for a long time and named it the "Combinatorial Explosion". Herbert Simon, both a computer scientist and an economist, has ever raised such an example. As playing chess means making permutations or combinations between chessmen (dozens only) and the positions (dozens only) in chessboard, Simon said: "The number of legally possible games of chess is estimated roughly at 10^{44}, a number that probably exceeds the number of molecules in the universe."![3]'[4]

The conclusion above can now be applied to the structure of "Instruction + information". For the narrative convenience, we could broadly call all computational results the "knowledges", regardless whether they are right or wrong. Then, as the computational speed is limited, the amount of operations that can be run by anyone during any limited period is limited, so the knowledges acquired are quantitatively limited in principle. Since the population is limited in size, the knowledges of mankind are totally and quantitatively limited as well. Meanwhile, the development of knowledges shall appear like a long-distance running, or like the chemical syntheses of atoms or molecules into new substances, which progresses continuously and accumulatively, roughly and irreversibly toward one direction. On the other hand, the potential of knowledge development would be infinite and inexhaustible, and hence there must be no finale for the processes of knowledge development, just like the universal Big Bang revealed by physics.

This consequence is obviously consistent with observable actualities. It can be used to explain why economic history is prominently a history of growth, and why growth is a kind of normality and regularity, and further to predict that growth will not stop. Economists have been, for long times, hesitant and doubtful on the long-run prospects of growth, which now can be clarified quite definitely; and hence the Neoclassical equilibrium paradigm can be broken through into a new model of perpetual developments.

The quantitative analyses above are kind of challengeable, which hence will be consolidated below.

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[3] Simon and Jonathan Schaeffer (1992), p. 2.

[4] Here is another example. A song is composed of several dozens of sorts of sound elements only, but the songs that can be compiled are believed to be uncountable.

3.2 Bounded Rationality

Since the structure, the tools and the mechanism of human thinking, as AFT describes, are specific and "concrete", it could further say that the "computational power" is limited, referring to the limitation of Instructions, operations, the speed, the storage capacity, etc., therefore it can be collectively called the "finite computational power" (hereinafter referred to as "FCP"), which could be an accurate interpretation of Simon's concept of "Bounded Rationality"; thus the latter will not be a negative concept any longer. Instructions and data are clear and transparent to us (except Artificial Instructions), so the limitations of the knowledges produced by them can be conjectured by anyone. The low level of knowledges originated from an operation or Pure Simple Operations can be used to explain the existence of barbaric ages and those phenomena of underdevelopment, and further to conclude that the achievements and civilization of mankind came from knowledge accumulation and spreading. Bounded Rationality shall not imply that there is, as someone understands, an absolute boundary for knowledge develpoment; giving endless computational time, human thinking must, on the contrary, intensify unboundedly. Thus a correct balance between infinity and finiteness is established. In the below we will equate FCP with Bounded Rationality and use them alternately.

We have in Section 3.1 quantitatively demonstrated Bounded Rationality, but the latter can also be understood in many ways; one of them lies at the conflict between quantity and quality. The main reason why mainstream economics prefers quantitative analyses shall be that it implicitly believes that all qualities can be in the end perfectly transformed into quantities, thus qualitative analyses are only a prelude to quantitative analyses and the latter are the lump-sum finale. Now, while thinking processes reviving, qualitative analyses shall be reasonably regain their relatively independent significance, and quantitative analyses hence shall be relegated into only partial revelations of the world; except quantitative data, we need to pay additional attention to the diversities, pluralities and heterogeneities of the world. Therefore, beside mainstream economics, other schools of economics, most of which (e.g. the Game Theory) dedicated to qualitative analyses, would be meaningful.

FCP, or Bounded Rationality, has tremendous forms of existences, and its diversity might surpass our imaginations. For example, information search or interpersonal communication can be regarded as a consequence or a manifestation of FCP. Due to the limited function of Instructions, the marginal computational outcomes from given original information will eventually decrease, so input of new information is needed. Therefore, the phrase "new information" actually belongs to Algorithmic narratives, otherwise it would be puzzling. The following many topics as subjectivity, arbitrariness, "irrationality", uncertainty, conflict, innovation, plurality, complexity, engineering, institutions, organization, money, "Invisible Hand", the macro-micro relationship, the ontology-methodology relationship, the theory-practice relationship, etc. are all actually the manifestations of FCP, which will be explained respectively below.

3.3 Pluralities, conflicts and complexities exist widely

The fact that computations are underway entails that there are problems for actors, or that the objective world is more or less confusing in one's eyes. In other words, there are contradictions and

conflicts somewhere. Since the computing power is finite, will the contradictions and conflicts be completely eliminated once a certain of computations done? It can be inferred that some of them, to some extent, may have been coordinated and/or eliminated; but, as the world is vast and changing, the rest of them cannot be, in general, completely eliminated. The day when complete elimination of contradictions and conflicts happens can be regarded as the doomsday which, based on Combinatorial Explosions, will be predicted to come never. Therefore, a typical state of the real world is the pervasive existence of contradictions and conflicts, coexisting and mixing with consistencies, showing various particularities and irregularities. Thus, the words as "different", "diverse", "heterogeneous", "structural", "complex", "Big Data", etc. can be respectively expressive to some facets of the world, just like the semi-products in a factory are in various forms or productive stages.

These various thoughts are copied and distributed spatiotemporally among the brains of different persons, so one's brain is usually a mixture of "knowing and unknowing", of similarities and differences, of consensus and disputes, and both in great numbers. A person's "relations" with his own past or future must be alike to those among persons, thus an "individual", or the "ego" will not be completely self-consistent.

Since the mission of sciences is to reveal laws, revealing the wide existence of differences, pluralities, conflicts and complexities is just a revelation of "laws" -- although the laws revealed here differ from those traditional ones, which, not only as ideas or beliefs that economists admit orally, shall now be the new and integral elements of the hardcore of economic theory, and shall initially enter into analyses in parallel with other laws, forming up a new whole and entire framework. This is the conclusion we have to draw, and the method we have to propose.

3.4 The Algorithmic Logic, Heterodox Algorithms and Mental Distortions

The introduction of thinking time looks common, but its effects are actually very special. It put actors in a plight unanticipated by the Neoclassicism, but very real. Typically, as the demands of actors (e.g. one is hungry) need to be timely satisfied, computations and hence decision-making has to be made also timely; However, the computing power, knowledges and other resources available are all limited and, probably insufficient; Consequently, the supposed precise and perfect computations (e.g. deductive reasoning), often costing too much time or requiring data strictly, may not work. The actor has such information or knowledges but the decision-making may require others which are not on hand, and cannot be timely acquired. The variables concerned may be many, but their significances vary; he or she has to selectively value those most important or urgent variables, instead of treating the variables in the given order. The actor must develop some easy, quick even perfunctory skills and methods to cope with the case of knowledge insufficiency. Another case is that in spite of the concreteness of a problem faced, its proper answer indirectly pertains to some macro, overall, basic or long-term issues in the distance, or in the whole world, which could eventually refer to shaping one's lifetime outlooks, values, attitudes and strategies that then are used to guide and support solution of the current problem. In other words, actors often need to, briefly and timely, conclude the whole world for one decision i.e. "outline the whole journey in the halfway", thus it shall be better to draw some slapdash, ambiguous even flawed conclusions than to do nothing. As a result, the so-called "subjectivity" or "irrationality" will, here or there,

reasonably happen, which is an optimization of the computing economy under the structure of "Instruction + information", simultaneously in favor of the mainstream "rational" rule.

The above processes can be called the "Subjective Turn" of computations, or, in a vivid term, the "Mental Distortion", which means that human mentalities go apart from the Neoclassically "correct" track, distortively falling aside.

Mental Distortions can be explicated again through clarification of the relationship between deduction and other methods. Deductive reasoning refers to the extraction or derivation of a new proposition from two existing propositions. However, how can the existing propositions be acquired? The answer "deducted from other deductive reasoning" shall be not satisfactory, because the number of deductive inferences that can be carried out, due to FCP, is always limited, not available anywhere. Deductive reasoning is often tedious and cumbersome. Therefore, the existing propositions can initially come from other non-deductive methods. For example, induction is apparently such a method, which usually inducts experiences into some simple, direct, quick hence economical but uncertain propositions. Another non-deductive method is "assuming". If a variable cannot be valued right away, it can be arbitrarily assumed a value, thus subsequent computations could head on -- and then feedback and amendments might be made to the assumption. A relevant method is "backtracking", that is, as the value of the current variable is unknown, but for any possible reason, the value of a logically subsequent variable has been known first, then computations can, based on the known value, go backward to tentatively value the unknown. "Heuristics" is based on some under-reliable but referential signals, to approximate the value of a variable sequentially, attempting to find a better answer.

Most of the non-deductive methods which people usually use, or which non-mainstream economic theories emphasize, can be defined and located in the above framework, as either Instructions or Algorithms. The definition of Algorithm and Instruction are somewhat interdependent. When certain Instructions are clearly defined, an "Algorithm" refers to a method or a pattern to make (a) combinations or permutations of the Instructions. If Instructions change, Algorithms follow suit. According to the terms of computer science, a fixed combination or permutation of Instructions can further be called a "Command", which is a component of a "high-level language", quite close to natural languages, and sometimes is used in parallel or mixed with Instructions, hence referred to also as an "Instruction". Moreover, the verbs in natural languages referring to thinking actions, no matter executable in a computer, can be roughly called "Instructions" as well. Reversely, if a thinking action can be decomposed into a combination of some basic elements or steps which are quite simple, universal or familiar to us, AFT could be deemed verified again, to some extent. As mainstream scholars always regard deductive method as the "orthodox" or core method (or in our term, the "Orthodox Algorithm"), correspondingly, all non-deductive methods are herein called the "Heterodox Algorithms". Proving "Subjective Turn" or "Mental Distortion" entails that Heterodox Algorithms will be frequently applied in real computations.

Heterodox Algorithms could vary infinitely, but it is useful to detail them further. For example, "Search", whatever as an Instruction or a Command or an Algorithm, plays an important role in computations. "Search" can be used either to obtain new original information, or to explore existing and ready-made knowledges. As the Neoclassical theory implicitly assumes zero computing time and cost, data search is insignificant; but now, analytical results are restricted much more to the search results. Another example is "Association". It is said that geniuses often feature excellent

associative ability, but how is association carried out? Apparently it is just to find some (prominent or hidden) characteristics of an object, and then search in memory for something similar or related to them, thus the importance of association also underlines "Search". "Learning" can be deemed a Heterodox Algorithm as well, which means primarily copying, a kind of expensive thinking behavior. Using the ready-made computational results of others can save, so learning might be smart. The word "imagination" means nearly "fantasy", which shows that human brain can get off the hook of original information and "create" ideas beyond it (although such ideas may not be able to transform into physical facts by actions), which thus highlights the role of Instructions. The relationship between Instructions and original information could initially be like "strange" or "unacquainted", then become "familiar" or "friendly" by computations. Neither shall we presuppose that they will in the doomsday completely agree with each other, nor that they will completely oppose to each other. This shall be a concretization of Kantian transcendental philosophy.

Other examples of Heterodox Algorithms include "Analogy", "Experiment", "Simplification", "Randomization", etc., which will not be discussed here in detail. Applying the above logic to interpersonal relationships, we can find the "social" Heterodox Algorithms as "Persuasion", "Negotiation", "Enforcement", "Deception" etc. As people's opinions are Algorithmically divergent, "Persuasion" is needed; And as everyone's Instruction system has been assumed to be identical, different persons use the same Instruction to process the same data, the result remains the same, hence it would be possible for those who persuading, discussing or negotiating to reach a consensus or an agreement. However, "Persuasion", as a computational and communicational action, also takes time and costs – possibly infinite; if the decision concerned has time limits, "Persuasion" may not be feasible, consequently "Enforcement" or "Deception" might be launched. Conditioned with FCP and hence pervasive conflicts, one is not expected to voluntarily cooperate with others at a given moment, thereby one may be forced, by some physical means or threatening discourses, to satisfy others. "Negotiation" and hence an agreement is to set some interests to induce somebody to cooperate voluntarily. "Deception" means deliberately making false information to mislead others, which, in a circumstance of FCP, may not be timely debunked, and then the cheater might succeed. These heterodox issues can now be collectively discussed under the name of Heterodox Algorithms, so as to explain how Orthodox Algorithm of deduction is frequently crowded out.

According to this logic, operational steps rationally shift over various data, Instructions and Algorithms. The actors have to frequently face and answer such questions as: Whether to collect information or to compute data? Whether to introduce knowledges from outside or to develop knowledges by oneself? Whether to obey a convention blindly or to analyze on the spot? Whether to adopt an accurate but slow method or a rough but fast one? Whether to avoid a question or to answer it? Etc. The actors have to make comprehensive judgments. Operations go ahead step by step, looking disorderly, but actually abiding by the "dual-leveled" logic which is apparently distinct from any traditional reasoning in textbooks. Let us call the logic "Algorithmic Logic". As the traditional logics infer with omission of the time, space, cost, benefit and other material features of thinking behaviors, we can further treat Algorithmic Logic as the "general logic" that actors are actually and generally using, and treat the traditional logics as some simplified particulars.

3.5 Knowledge stocks sedimented and patterned

For a single operation, or the Spot or Current Operations, datum stocks or knowledges are precious resources; without the stocks, the intelligences of contemporary people are bound to be similar to those of barbaric people. If readers agree with this point, we would have, from the perspective of economic theory, uncovered the mystery of knowledge stocks, finding out their origin and significance. Meanwhile, the formation of stocks will also aggravate Mental Distortions. To illustrate this, we need to start from how stocks are originally formed.

The original formation of knowledge stocks may be unintentional. Computational results were only kept inadvertently and casually, their usages in the future were not exactly known. When an actor is thinking but turning helpless, he or she might perceive the existence of knowledge stocks and then recall and search them, tentatively to find out something useful. As long as they are expected to improve Current Operations, the knowledges found might be adopted. Once successfully thereof, he or she will be motivated to, at spare time or when not urgent to make decisions, deliberately collect, import and preserve more knowledge stocks. Part-time or amateurish researches will perhaps evolve into full-time researches, then intellectuals, as a kind of social role, who devote themselves concentratively to knowledge development and subsequently "sell" their products to practitioners to make living; Thereby the industries serving knowledge spreading and education will form up, just as how the physical factor industries arise. Knowledge stocks can be duplicated, transmitted and reformed both horizontally and vertically, or synchronously and historically. Besides the means of mass communication, there must inevitably be a large number of fragmented knowledges spreading privately or personally in smaller ranges.

The utility of knowledge stocks is to guide the Current Operations which do not know where to go. However, as mentioned above, knowledges produced in any way may contain mistakes or demerits, which cannot be completely avoided even in professional productions, because working time and workloads restrict all researchers. Spatiotemporal barriers prevent the knowledges produced in a certain circumstance from fully fitting in another circumstance, even if they are prepared deliberately in advance. Users of knowledge, who are busy on Current Operations, are usually unable to entirely examine the compatibility of the knowledges adopted. The examination, if any, would be limited and partial, and never be complete. What the actor takes use of the knowledge stocks is just that knowledge stocks are ready-made. Once the time and costs of knowledge examination exceed those of knowledge development, knowledge stocks will become futile, and the users will make the knowledges on the spot by themselves while discarding those stocks. Metaphorically, a knowledge stock is a double-edged sword, which may mislead the actors, restrain their freedom and imagination, or even hypnotize them, making them conservative.

From above perspective we can find the true face of knowledges. Knowledge stocks are actually resulted by slapdash or rash decisions, which otherwise and ideally shall not be made this way. The view can be reached in contrast with that of Neoclassicism. As perfect knowledge is usually not available, it can be inferred that the common "knowledges" are only the relatively high-quality ones selected among various and discrete computational results, then the rested low-quality ones are economically eliminated. Due to FCP, the audiences usually selectively accept the relatively "correct" knowledges among those available, even unaware of the relativity of the correctness, taking them absolutely. Absolute knowledges do exist – Algorithmically, "absoluteness" can be interpreted as the definiteness and constancy of Instructions, thereby logics

and mathematics can be deemed the results of "self-checking", or "dealing-with-oneself" of Instruction system, thus the "absolute knowledges". The certainty aroused thereof can be called "Transcendental Certainty" or "Logical Certainty". Since the information used in logics and mathematics is often only some highly-abstract symbols, their empirical contents are very weak. However, once Instruction system meets with the outside world, that is, when it is used to solve practical problems, nothing will be completely certain.

"Finished knowledges" usually suggest some conclusive outcomes, which must be more or less arbitrary or imprudent. In other words, the knowledges mean usually some patterns (or "module"[5]), which receive a certain input, process them by some fixed ways and by a small number of steps, and then quickly give output. They are thus concise and economical. A computer program, which readers could be familiar with, is an exemplary illustration of knowledges or patterns. Metaphorically, knowledges or patterns are like a solid, which is formed by sedimentation and coagulation of a liquid or gas, and equipped with some entrances and exits where Current Operations, just as the liquid or gas, going through. Sciences are also patterned -- so they are only relatively correct and hence evolving. Knowledge patterning results in division of knowledges into different modules in accordance with tight or loose relationships among data, similarly to the dispersive oases surrounding dispersive water sources in a desert. Practical knowledges, or "engineering", come from this logic. Due to FCP, cognitive knowledges, including sciences, usually cannot go directly or reasonably into a decision-making, therefore researchers have to build engineering techniques around practical problems, which, often incompletely compatible with sciences, are quite independent. "Institutions" is a kind of social engineering, which impose some guides, restricts or requirements on actions rather than on cognitions. However, institutions, as something patterned or "brutal", shall not be idealized with the Neoclassical perspective. Once otherwise institutions become fully susceptible or flexible to stimuli, institutions will not be needed any longer. Therefore, traditional views of institutions need reform greatly; this is an important inference we could Algorithmically draw.

Generation of knowledge stocks leads to the stratified operations; this is to say, computational operations thereby are stratified into a hierarchical structure: "some variables applicable to stocks + other variables decided at discretion". Computations proceed circuitously between flows and stocks. Since stocks are arbitrary, rash, rigid even "brutal", computations hence are distorted again. This is another approach to proof of Mental Distortions.

3.6 Desires, emotions, instincts and impulses as "Hard Software"

Although computations supported by knowledges are more advanced than those without knowledge supports, they are still "biased", "skewed", "distortive" and imperfect from an ideal point of view. The adjective words above are similar to the meaning of "irrational" which is usually used to refer to the characteristics of desires, emotions, instincts, impulses, etc., suggesting that these spiritual things are not so "rational" in contrast with "rational thinking" of mankind. However, with the Algorithmic discoveries above, they could thereby de deemed some similarities of knowledge stocks, not essentially different from computational results.

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[5] Jerry A. Fodor (1983).

According to biologists and psychologists, desires, emotions, instincts, impulses, etc. are inherent and innate to human beings as higher organisms, which help humans interact with the environment and primarily react to stimuli. In other words, they are conducive to human survival, just like how knowledges contribute. Their responses to stimuli are direct, quick, and therefore useful -- but apparently imprecise and sometimes inappropriate. However, it seems that they do not change or develop as fast as knowledges, likely remaining constant. Therefore, they can further be deemed a kind of "hard software" which is formed with a specific structure of hardware (e.g. a specialized fixed circuit) in a computer, working jointly with software programs but usually unable to be upgraded.

The significance of this auxiliary theory is that it largely expands the AFT applications while keeping its formal simplicity, thus a unified framework of rationalities and "irrationalities" forms up. In the past, as the innate thinking tools, or Instructions, had not been distinguished from the "innate knowledges", any theory concerning a priori or innateness was ambiguous, consequently neither "rational thinking" nor those "irrationalities" were properly understood. Freud described lengthily various "irrational" phenomena in the spiritual world, which, examined one by one, could be Algorithmically deemed Mental Distortions or their similarities, rather than the distinct dissimilarities that Freud mistakenly hinted.[6] Obviously, what should be formed first is the thinking theory than any "irrational" theory, then other spiritual phenomena can be analogically and reasonably explained.

Another advantage of AFT as the unified theory is to technically relegate such question as "whether acquired knowledges can be inherited or not". Even if inheritable, obviously what inherited are not essentially different from the knowledges acquired by inheritors, and only in very small number. Further, AFT, together with this auxiliary theory, can explain why "human nature" often look so prominent to observers. "Human nature" can be deemed innately a composition of one's "inherited knowledges" which, based on hardware, hardly evolve as quickly as "pure software" or computations, hence the gap between them keeps widening. And as a small part of the "inherited knowledges" may be originally acquired by one's predecessors and hence be partly and interpersonally different, one has one's own constant natures or characters during one's whole lifetime, which are mixed with one's own acquired knowledges.

The above framework would be enough to explain a large number of phenomena which used to be deemed beyond the rational spheres. For example, the spiritual "mysterious" complexities and unpredictabilities, which often stressed by humanists, could now be deemed Algorithmical consequences. Chess was traditionally regarded as a typical mankind activity, however, as the famous AI project "AlphaGo" successfully broken the illusion, it was then realized that the chess mystery was just based on the complexity and uncertainty arising from Big Data. Intuitions can be interpreted as "automatic computations" by human brain, which used to be a source of mystification. Automatic computations literally exist, but they are limited in quantity, and can be intervened by conscious thinking, thus their smooth operations need the conscious authorization, just as a computer authorizes some of its parts to operate independently in a certain range. In fact, the conscious thinking system sometimes "indulges" some spiritual activities heading on their own, without any intervene, this is not because of its inability of controlling them, but the consideration of computational economy. For instance, a person can show some emotions naturally, but can also hide them deliberately, as long as he or she thinks it necessary to pay extra price for "hiding". In a word,

[6] Sigmund Freud (1922).

many misunderstandings are rooted in lack of the thinking theory, hence unaware of various manifestations of the Algorithmic economics.

3.7 Convergence, divergence and "Higher-Order Consistency"

By far the role that mainstream Neoclassical economics could play in Algorithmic framework has not been clarified. Neoclassical economics portrays the world as some convergent processes toward a certain static state -- General Equilibrium. Considering Combinatorial Explosions between Instructions and data, Neoclassical model as the model of the whole world, could be wrong. However, are the Neoclassical narratives totally untrue? The answer is No either. In the real world, there are indeed many statics, constancies and convergences, but, obviously, which exist only locally – in local times, or local places, or local arenas, or logically local aspects, etc. How could we integrate them with other non-Neoclassical existences? AFT can now work.

AFT portrays a discrete thinking world, where information, knowledges, thoughts and computations exist dispersively in many independent units, just as physical objects existing in different positions of the space, where there are many gaps or vacancies among the objects, which allow that an object can move individually and separately without interferences from or into other objects. Similarly, personal computations, interpersonal communications and interactive computations can be carried out respectively within some relatively closed ranges. The closing-up could be economical. Without external interferences, and with finite internal complications, these isolated entities might evolve quickly and, as marginal computational returns decreasing, eventually converge into a relatively stable state – an equilibrium. An equilibrium might be an Logical Certainty which will remain stable permanently; However, in more cases, the equilibria are "empirical"; this means that the actors are just so satisfied or so despaired that they no longer invest additional computing resources, instead they turn their attentions to other areas -- where the expected computational returns are higher.

Such equilibria can last long or short, beside which the actors are engaged in new researches and explores, then the computations return active; This is called "divergence", which could prevent the overall computational activities from diminishing. Subsequently, The new knowledges generated by divergences may return to impact the existing equilibria, even to destruct them, and/or to synthesize them into the divergent processes.

In this way the flaws of mainstream economics can be clarified and then remedied. In fact, Neoclassicism cannot permit heterogeneity or mixture. Under the presupposition of perfect rationality, each "thought" is assumed to adapt to any other immediately and "completely", thereafter any thought existing before our eyes is assumed to be tightly connected with others, nothing independent, pluralistic, conflictive or improvable. This could be why Neoclassical economics is incompatible with other schools of economics.

Some readers may ask: "Are those above really novel to us? Why do not the various thoughts in the world change synchronously?" The answer pertains to another principle hidden in the Algorithmic framework, that is, it is impossible for the world as a collection of product stocks to move synchronously along with various flows, the impossibility is endogenous and is a consequence of Roundabout Production Method. It is just because actors are unable to change all of the (physical and thoughtful) objects at the same time that they set up the stocks, leaving them unchanged, so as to "free up their hands" to focus on the development of flows, and to roundaboutly

perform between stocks and flows; Otherwise, if actors are able, the stocks are obviously unnecessary – as Neoclassicism hinted. The world containing various stocks is like a paper in front of us, and the actors are just like some dots in it, which move and perform, changing here and there, but cannot synchronously change everywhere.

Why does this approach mean the "grand synthesis" of economics? Further explanation is needed. The existence of spatiotemporal context makes possible the symbiosis of different or conflictive ideas, including that of observers and the observed, just like space making possible the peaceful co-existence of fires and explosives. Secondly, as mentioned above, the differences and conflicts in Algorithmic World shall not be deemed metaphysically absolute, but some temporary consequences of computing economy. While computations keep going on, the existing differences and conflicts are possible to turn coherent or consistent. This possibility can be called "Higher-order Consistency", which, otherwise Neoclassically missing, allows some theoretical inconsistencies or imperfections while the synthesis or unification are being basically made up.

3.8 Networked evolution

Many Algorithmic persons form a group or a society, where many special effects would happen and hence many socio-economic phenomena, which mainstream theory cannot explain, would be explained, and therefore the defects and errors of Neoclassicism can be clearly diagnosed.

The fact that each actor is "equipped" with an independent "computing machine" – the brain – to carry out Spot or Current Operations is distinct from that, as the mainstream hints, all people share a "Super Brain". Now there must be many computational repeats, as well as many interpersonal differences, incurred. Localized operations not only avoid some communications, but also cause other. Many Persons observe, compare, imitate, cooperate and compete with each others, arousing various and volatile relationships. "Communication" refers to the conscious, direct and informational exchanges among persons, mainly by means of languages; Moreover, there are still tacit, one-way, passive and unconscious exchanges, which could avoid some direct communicational costs. This shall be where the subtlety of the society -- as a "network" -- lies. For instances, when one takes an action, it may be found and imitated by others, but without one's perception of the others' responses; Or, the action unconsciously influences others positively or negatively – thus externalities happen – but the others respond only passively and indirectly, unaware of existence of the action itself, and the responses objectively encouraging or deterring his/her subsequently actions. The mixture of the consciousness and unconsciousness can be called "Semi-Internalization", which leads to a society that is seemingly controlled to some extent by an "Invisible Hand" (Adam Smith's words). Semi-Internalization explains that there are many "loose" or "free" areas in the society, where actors can act at their own discretion while avoiding clear responsibilities – although their actions causing some consequences.

The socio-economic order formed as above must be impossible to be entirely clarified by anybody, even if some of them, or the mechanism of Semi-Internalization itself, can be recognized. This is not a mystery, but a result of "Big Data". Such an order also suggests a wholeness, where everything depends on one another to some extent, despite of symbiotic discreteness or irrelevance.

There are still many other mechanisms existing inside network computing, which includes institutions and organizations. As hinted above, knowledges imply the rules of self-discipline, which, when involved in interpersonal relationships and practical behaviors, transforms into

institutions. Institutions are for public affairs. It is impossible for an individual to take care of all affairs by acting alone, which is just a utopian plan of theorists under the presupposition of perfect rationality. If readers agree with this point, it would be reasonable to endogenize public affairs beside private affairs, which can be regarded as another manifestation of FCP. In Algorithmic framework, an individual's will is free, and freedom is both possible and necessary; therefore, cheat, speculation, and shirking are all possible. This leads to the necessity of stipulation and enforcement of institutions. However, due to the complication of computing, institutional enforcement is risky yet, which may cause serious mistakes, therefore the "formal" institutions are restricted to a small range, applying to those most appropriate matters, while other affairs still relying on Current Operations, or the other "informal", elastic and various institutions.

Current Operations aim at those matters that, due to FCP, cannot be clearly and orderly planned by the society in advance, which therefore the actors have to respond to separately and hence, more or less, conflict with one another; Consequently, some wastes occur. Further, it can be speculated that making interpersonal coordination, under certain conditions, would be profitable. Once some people realize it, they may voluntarily form an organization. Or, a person establishes an organization through "buying", the people who are "bought" getting relatively fixed remuneration, or wages & salaries; In return, instead of deciding on their own, they follow their employer's orders which are often orally, precisely, sequentially and realtimely given on the spot of work[7], rather than prescribed ex ante literally as rules, bylaws, directions, referrals, etc. This arrangement can significantly build up interpersonal coordination – additionally saving the knowledges that otherwise need to be built by every organizational member as a freelancer. Due to the heavy heterogeneity of the social world, many organizational cost-benefit relationships vary in the space-time context, resulting in various organizational sizes or shapes, and in its coexistence with tremendous freelancers.

The aim of a social order is mainly to implement the existing knowledges, which, coming from history, preserve the living standard. Nevertheless, influenced by the changes of physical conditions of human life, an extremely conservative strategy would be not enough to maintain the past life, thus innovations are necessary. Fortunately, knowledge stocks can be used to make spare time for actors to explore unknown fields; Since they were made in history by slapdash and coarse computations, and within limited fields, knowledge stocks are possible to be improved or extended, whereby innovations are like climbing a ladder. New discoveries come either intentionally or accidentally, and from new information or new Algorithms. Especially, since the predecessors had been Algorithmically forced to "conclude" the whole world, and now the world is forced to be "concluded" again, thus the knowledge stocks, as a whole, develop likely as an onion grows, outer layer covering inner layer, and improving both qualitatively and quantitatively.

The above is at the macro level. For individuals, knowledge development must be in various ways. One of the advantages of a free society is its tremendous and concurrent attempts in huge number, which are very conducive to innovations, but, of course, at enormous sacrifices. In fact, the relatively stable performance on the macro level is the result of offsetting enormous harsh but contrary activities on the micro level. The more advanced the means of knowledge storage and spread, the faster innovations will be. The closer the interpersonal distances, the stronger the interpersonal homogeneity is. Correspondingly, the larger the scope of communication, the more opportunities for innovations there are. If readers agree that physical experiments often cost more

[7] Ronald H. Coase (1992), chapter 3.

than verbal “experiments”, the rule of free speech will be deemed economical and then rational, which accelerates the dissemination and exchange of ideas, thereby avoiding the brutal experimental practices concerned.

From historic perspectives, economic growth is found to be quite strictly regular. This induces our thinking in-depth. In my opinion, one of the reasons shall be the strategical application of the leverage between conservatism and radicalism. Conservatism can be used to preserve the existing developmental results, whereas radicalism may bring huge profits -- or heavy losses and then the retrogression. A typical strategy is to build a moderate and balanced relationship between conservatism and radicalism; this means, while maintaining most of the current arrangements, only marginally and selectively implementing those most promising new knowledges and leaving other new ideas abandoned, suspended or experimented in small scales. The strategy could persist until the innovation-driving growth becomes monotonous and sustainable at macro level.

However, decision-making can never be completely free of risks. The socio-economic development is a process of continuous but brittle construction, despite the above offsets in large number. Once behavioral synchronies are too strong, and the reverse offsets arrive not timely or insufficiently, monotonous growth will be jeopardized. Advancement means just gropes, often with tosses and turns. Business Cycles, crises and disasters occur initially at the micro level, then possibly rise to the macro level. If people live permanently in a stable society, for an Algorithmic effect, they will probably become lazy, reckless or arrogant. Viewed in this way, an everlastingly stable society would be less possible; even if they do not happen frequently, crises will not be extinct, but play a role for a healthy life.

IV. How to Build a Unified Economics

4.1 The synthesis of various schools of economics

In the above, a deductive and whole theoretical system has been formed -- even if some aspects of it have not been mentioned here -- which has partly or implicitly included the synthesis of various schools of economics. The aim of this section is to make a further and supplementary narrative of the synthesis. The method used here is that, if we can relate the elements of a school to any part of Algorithmic Principles, its synthesis could be deemed realized. Due to space limitations, the narrative has to be restricted to those most prominent characteristics of each school.

The major elements of Neoclassical Economics include: optimization (maximization), deductive method, equilibrium, price, utility, marginal analysis, etc. The Neoclassical theory implicitly assumes zero computational time or infinite computational speed, which results in most of its faults. Infinite computational speed is consistent with the hypothesis of perfect rationality, but drive deductive reasoning out of the control of analysts, thus analysts have to allege, when an equilibrium reached, that any “rational” factor concerning the topics have been exhausted and thereby that the leftovers are just “pure subjectivities” (e.g. utility, aesthetics, political beliefs or ethic values), or “pure objectivities” (e.g. the alleged risks & uncertainties), or the topics of other discipline (e.g. technology) -- otherwise their analyses or theses would be unreasonable to finish. Under the pressure of zero thinking time, the assumption that “transactions can happen everywhere

at any time" is embellished as plausible, the price system are interpreted as a final and perfect conclusion or epitome of all economic variables, which hence devours the independence of any qualitative analyses. The approach to correct the above mistakes is, as given in Chapter 3.2, to adopt the principle of pluralism, recognizing the independent but equal existences of transactions and other human activities, and hence of prices and other kinds of information, while admitting the occasional comparative advantages of transactions or prices over their counterparts. In history, introduction of the concept of utility has been revolutionary, which could be deemed a sign of subjectivity's entering into economics. However, utility cannot be treated absolutely, because the consumer preferences contain many knowledges and rationalities, just as the "rational" thinking for utility maximization actually contain a lot of subjectivities. Any thinking process now needs to be viewed in principle as a comprehensive or mixed whole. The marginal method was originally used, spatiotemporally, as a simplified and tentative method, no matter whether the functions relevant meet the requirement of convexity. Now, it shall return to its origin, just selectively as one of the various "Heterodox Algorithms".

Macroeconomics contains the elements of statistics, irrationalities, disequilibria, money, governments, public policies, etc. It follows the tradition of empirical researches, which can be bridged with theoretical researches by (as demonstrated in Section 3.4) FCP: As the results of theoretical reasoning are Algorithmically limited, researchers have to resort to experiences or empirical observations; however, the arduousness and uncertainties aroused from empirical work might thereafter push researchers back to theoretical refinements. FCP can also bridge macro with micro as follows: As the sights of actors are Algorithmically limited, they can only see and compute local or "micro" objects nearby; In order to see a whole picture, they have to remove to a far or higher place, or use an abstract method e.g. the statistics -- just as a pilot may from the plane find out some "Crop Circles" on the ground. However, a remote observer is usually not able to see the objects in detail. Similarly, both micro and macro actors (e.g. governmental officials or economists) obtain different but limited information, then think and act differently, and both with limited rationality. The narrative above is literally common, but the Neoclassical perfectionism implies that the different data from different sources could be processed and then integrated into an entire harmony, therefore, Neoclassicism has essentially precluded the theoretical importance of sights, or information, which now can be Algorithmically revived. As for the "irrationalities" and disequilibria underlined by macroeconomics, it is unnecessary to discuss further. Governments, money and public policies will be explained in the next section.

Contemporary heterodox economics has the following four schools: Evolutionary Economics, Behavioral Economics, Game Theory, Institutional Economics. Evolutionary Economics emphasizes dynamic developments, however, due to the lack of a proper and performable theory on the evolution of human thinking, Evolutionary Economics is suffering from ambiguity and chaos. Readers may find out that those phenomena highlighted and reiterated day by day by Behavioral Economics could be theoretically generalized as some examples of Mental Distortions. Game theory arose from abundant practical cases, usually so convincing to readers that it is misunderstood as an extension of mainstream economics. However, game theory features qualitative analyses, conflicts, Nash equilibrium, etc., any of them challenging the mainstream, and reminding readers that game theory is mainly about conflicts and struggles, rather than the mainstream harmony. Nash equilibrium is a negative deadlock, which exists with some clear conditions, and can be broken with environmental changes. This discussion is connected with the convergences and divergences above.

Chicago school (including Institutional economics) has long straddled between the mainstream and the heterodoxies, likely unaware of their conflictive premises – the former perfectly rationalizing while the latter mostly with bounded rationalities. The contentious concepts of "risk" and "uncertainty" reflect the confusions. Probability can be illustratively used to show that human thinking might interpersonally achieve consensus but the consensus might be not satisfactory to explain or predict the real world. The school unilaterally blamed the unsatisfactoriness on the objective world, hinting that the objective world has an "original nature", named after "risk" or "uncertainty". This idea could be deemed just flattering the mainstream rationalism -- just like the mainstream claims that values have nothing to do with reasons. Nevertheless, a Chinese maxim says: One spam cannot clap. Cannot the unsatisfactoriness reflect the limitation of thinking tools of mankind? Limited thinking tools meet limited objects, their outcomes are usually between "perfection" and "ignorance", and probability could be one of them. The comparative advantage of this Algorithmic stance over that Chicago idea is that the former is compatible with knowledge development, but the latter is not. When we notice that the problems that have been answered probabilistically might be subsequently and "certainly" solved through other approaches, we shall never claim that the "risk" or "uncertainty" thereof must be the "original natures" of the world.

The rested schools (e.g. the significant Austrian School) will not be elaborated here, as some of them have been implicated in the above statement, and the others will be included below.

4.2 The synthesis of various branches of economics

Based on the above various narratives, the face of a whole socio-economic system is become clear, where the topics of all economics branches entering into. Nevertheless, some important issues are still missing, which are to be briefly remedied in this section.

The first is money. Money is easy to understand in common sense, but difficult in theory, due to the stonewalling by Neoclassicism. Once the assumption of computing speed converts from infinity to finiteness, money will thus be endogenized immediately. Money, as the general equivalent, is the intermediary for price conversions during commodity exchanges, meaning that money can significantly reduce the times of price conversion, resulting in saving of computing resources. Otherwise, under the assumption of infinite computational speed, price conversions could be carried out freely, it is economically needless of general equivalents, or money. Secondly, in the non-Neoclassical space-time context, money exists not only as a calculative unit, an abstract symbol, but also as an entity, "held in hand", moving with its holder and deliverable to the seller on the spot of transactions. This requires that money must be a sort of physical entity, with some appropriate physical characteristics – such as being suitable and easy to be carried, separated, deposited, etc. In the era of Mobile Payment, money does not have to be "held in hand" any longer, showing that "held in hand" is actually the result of lack of communicational means, or, and hence, the interpersonal credibility -- both of them has been Neoclassically precluded. Nowadays, Mobile Payment is seemingly leading Chinese monetary system into a system based on Account Money. A developed monetary and financial system can convince the haves to readily unleash control of their assets for social use, thus greatly improving the efficiency of resource utilization. At the same time, it also intensifies the interdependence of all parts of the society, leading to a variety of synchronous and asynchronous problems.

The second turns to the capital and production theory. The Roundabout Production of thoughts forms the stock of knowledges. Similarly, the Roundabout Production of physical goods needs and forms capital goods, which is originated from the limitation both of thinking ability and action ability, and hence from the limitation of the "comprehensive ability" of mankind. The word "capital" originally refers to a sum of money used for investment, and hence for profits, by purchasing thoughtful and physical goods as the conditions of production. However, production is inter-temporal, the indivisibility of capital goods leads to the fact that the capital goods prepared in advance can be continuously used for long-term productions. Therefore, the investment decision has to be predictively made, and the price of finished products will be used to test the prediction. In the past when economic theories failed to achieve satisfactory dynamics, these classic and reiterated theoretical problems were actually impossible to be properly dealt with. Now, it can be Algorithmically clarified. The Algorithmic capital and production theory, while integrating existing theories with Algorithmic consequences, could give basically the following points: 1. Caused by FCP, price gaps in the Algorithm world can be very common and widespread, and in various forms. Since innovations can be regarded as the "arbitrage activities" between the present and the future, profit opportunities must be pervasive and endless. Profit rates must vary, and would be one of the most volatile variables. 2. Considering that the fluctuation of factor market will lead to revaluation of the stocks of capital goods, and that the prices of finished products are uncertain, it is impossible in principle to establish a perfect and dynamic relationship among capitals, rates of return and price fluctuations. That is to say, pursuant to the Neoclassical standards, it is impossible to unify the capital theory and the price theory – this shall be why the capital theory failed historically. Conflicts, fluctuations and imperfections thus must be accepted as some core elements of the economic theory. 3. Conflictively or imperfectly, production is a closed process that is not often open to the market, and purblind to market fluctuations. This fact can be used exemplarily to reform the mainstream theory of transactions, denying that "transactions can happen everywhere at any time", relegating the price theory into a partial and unilateral one, and toward a whole pluralistic and qualitative framework.

Production, consumption and other activities are carried out in certain places. This perspective can bring us into the Spatial or Location Economics, whereby the various issues such as locations, layouts, communications, transportations, circulations and environmental protection can be integrated, as the analysts thereof do not have to bear the "Neoclassical burden" any longer -- that is, it is unnecessary for them to coordinate every topics with the price system or equilibria everywhere and every time, they just depict and analyze the real world they are facing. The above organizational theory can be further extended to the areas such as enterprise theory, competitive and industrial organization theory, management economics, etc. FCP will also lead to the issues of income distribution and inequality, as the notion of "inequality" pertains to the belief of equality or justice which could be deemed a result of Mental Distortion. The introduction of currency will make cash flow a relatively independent issue, which further leads to the occurrence of crises, and then the necessity of governmental intervention.

The Algorithmic institutional and organizational theory provides the basis for endogeny of governments. From the FCP perspective, we can infer that commodity transaction cannot solve all problems, and public goods and externalities therefore emerge. Their emergences relate not only to the natures of the goods themselves, but also to the actors' ability to trade and charge. Algorithmically, it is not convenient or economical for the society to record, and then to precisely

charge the use of public goods, so it adopts a quite simple, vague and egalitarian rule to run public utilities, which results in the public finance and taxation systems. Personal opinions, due to their subjectivities, are various and conflictive; but public affairs, due to their indivisibility, require only one choice, so public affairs have to be mandatorily decided and implemented.

FCP reminds us that the organizational characteristics of a government, and its ability limitation, need to be emphasized. A centralized organization acts quickly, while decision-making must be relatively rough and rash; a decentralized organization makes detailed but discordant decisions, and the decision-making is relatively slow. Therefore, any government needs to weigh up or conciliate between the two organizational patterns. A government is usually composed of the branches in charge of laws as knowledge stocks i.e. the legislative and judicial institutions, and the branch in charge of Current Operations i.e. the administrative departments. The Planning Economy, relying mainly on a few individuals' wisdom, is endogenously unfeasible; On the other hand, anarchism, relying only on free individuals, is unfeasible as well. Governments both cooperate and compete with markets and the civil society. Only when all kinds of individuals and organizations are characterized, can we correctly understand their plural relations. It should be easy to find the reasons for governmental intervention from various market failures; however, restricted by governmental ability, the society has to tolerate a large part of these failures so as to wait for market progresses, or to avoid bigger failures which may be caused by governmental interventions. Markets contain tremendous diversities, attempts, innovations and evolutions, where hopes and futures are bred. Reversely, governments are mainly a power to maintain social order, and the governing means and techniques also innovate or develop, which provoked the birth of social sciences and social engineering, the glorious missions of intellectuals.

4.3 How to carry out economic researches

A unified theoretical framework including subjectivity, pluralism, conflict, irregularity, and mixture may seem wonderful, but may cause some methodological questions among readers. For those possible questions, the author makes in advance an answer here, that is, Algorithm Method can be used not only to smoothly address ontological issues, but also methodological issues. A proper ontology on human thinking, integrated with general scientific methodology, shall be enough to fundamentally extract the methodology of social sciences. Reversely, under Neoclassical perfectionism, researchers become some meaningless spectators, and the questions such as why they study, how their studies differ from those of actors, etc. cannot be reasonably explained.

The methodology of social sciences shall be similar to the ontology of social sciences, except that they are "technically" different. Both researchers and the researched objects are human beings. Since the researched persons themselves have researched the world in advance of researchers' research, researchers just research those "researchers" as actors. This kind of characteristic determines that social sciences cannot be decisive over the knowledges already possessed by actors. A researcher used to be an actor before he or she become a researcher, and thus brought the actor's knowledges into researches. As researchers and actors can communicate and learn from each other, it is impossible for researchers to exclusively use any methods. On the other hand, as scholars are often, professionally, engaged full-time in researches, but actors otherwise part-time, scholars can therefore advantageously build some knowledges that common actors do not have and then perhaps are ready to "buy", hence their relationship of division of labor, trade and cooperation is established,

and scholars are involved in the real world and become a special kind of actors. The knowledges of scholars can be specialized as cognitive or actional, whereby social sciences and social engineering are distinguished.

According to their own roles and characteristics, scholars usually selectively study those problems with generality, constancy and certainty. This strategy conservatively include the following: Basing their studies on those premises as reliable as possible; Preferring deductive reasoning; Pursuing the accordance of conclusions with great number of experiences, etc. Thus scientific theories arise, which generalize vast facts into some simple forms and then draw the most reliable conclusions, resulting in huge computing economy, and enjoying the highest reputations among various knowledges. This means that the essence of a theory is actually its simple "form", otherwise it would have no advantage over the material experiences that bred the theory. Of course, making theories is not the only work for scholars. Any work, including making up empirical materials, deserves scholars' devotion as long as it is comparatively advantageous over common people, thus scholars' work and their social contributions are actually diversified. There are also some kinds of research work (e.g. religions), which are not under the name of "scholars" or "intellectuals", answering some of the questions that they cannot answer. All the specialized knowledges coexist with the experiences and common sense of ordinary people who comprehensively and selectively use them to solve the spiritual or practical problems they are facing.

However, it does not entail that application of any knowledge is enough to achieve success for actors. Any knowledge works only within the range in favor of cost-benefit analysis, while leaving those infinite unknown fields for ordinary actors. Algorithmic Theory characterizes that it can show the limits of a theory itself, then consciously bridge it with the empirical, or other non-theoretical approaches. With different comparative advantages, the existing various methods are selected or discarded timely according to their marginal cost-benefit situations. [8] Scientists are usually impossible, and unnecessary, to finish their researches with some "absolutely reliable" discoveries, but some "relatively valuable" ones. As their professional tenures are limited, and the paper spaces are limited as well, they often have to make Mental Distortions to close their studies, and hence committing demerits even mistakes. Consequently, sciences have to develop or "evolve" by way of new theories occasionally replacing the old ones, or a "scientific revolution" (Thomas Kuhn's word[9]).

A prominent problem of social sciences is that their spread across the society will change the beliefs, discourses and deeds of ordinary people, then change the factual basis, and hence lead to the ineffectiveness or invalidity of social sciences. The theory of Rational Expectation argued that interactions thereof will eventually cause an equilibrium between now and the future. However, from the perspective of Combinatorial Explosions, the equilibrium can, in the most, be only partial. In other cases, social sciences will, on the basis of new facts, develop again, and then influence the new facts again – thus the loop goes and recycles.

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[8] What the falsification method, proposed by Karl Popper (Popper, 2002), emphasizes is actually the comparative efficiency of computations. Whether to falsify or to verify a theory depends on how it is easy or difficulty under the context of Big Data. However, due to heterogeneity of the world, neither falsification nor verification is always viable.

[9] Thomas Kuhn (1996).

4.4 How to carry out economic researches (Continued)

This section discusses further some points on economic researches.

Firstly, economists shall take the real society as the "theoretical prototype", or "prototypical theories". The inferences and demonstrations in the paper could be regarded as the explanations how the real society is formed up. Although the explanations are quite simple and rough, the complexities, diversities and variabilities themselves are exactly what we explain, and hence what we anticipate instead of, Neoclassically, resist. Therefore, it is the right time for us now to make a leap forward, that is, to directly jump onto the platform of "real society" as our basic platform. All the previous work can be deemed the preparations for this leap.

A theorist can live in a room and use Algorithmic Logics to, starting from a computational operation, infer anything. However, as subjectivities happening frequently, the paths where the inferences can go would often amount countless, and which one would be really effective? This problem leads us to realize the academic role of the real society, or of the minds of real actors. To a certain extent, the real society shall be the condensed results of the computations and practices of all ancestors, and hence a collection of all "feasible solutions" as their findings among vast possibilities; The social life based on the solutions are largely successful. In other words, theorists shall firstly recognize the wisdoms and brilliances of the real society, and even revere or dread them. We shall not put aside the real society to develop a "totally new" set of theoretical models (e.g. General Equilibrium Theory), and then, based on it, carry out the whole research work. Restricted by FCP or Big Data, this approach must be unsuccessful. The real thoughts and real consciousness of actors, as a whole, could be deemed a ready-made "huge model" that has been existent before we start to research. Due to the small number of our researchers, we can only partly or vaguely describe, explain and predict the huge model, or intervene it marginally. As the Algorithmic World is imperfect, Researchers do have the opportunity to put forward questions, challenges and reformative suggestions to it; but, when a research finishes, we shall return to the real society, our benchmark, as soon as possible. This is what computing economy requires.

Since AFT is a fresh theory, the observations and theoretical reasoning embedded by AFT is expected to marginally discover or establish a series of new laws or regularities, including those of higher-order, but probably more than those explicated in this paper. The principles of social sciences and economics are hence to be trimmed, re-interpreted, intensified even rebuilt largely. The formation of new principles, obviously with huge potentials, shall currently be the most important and urgent, which can be carried out still "manually" as in the past, without adopting any numerical or programming techniques.

However, the "manual" method is not accurate enough, and hence computer simulations, as detailed or applicative researches, are necessary, which can be used to replace mathematics as the new formalized standard method. The existing simulations have achieved affluently, but still unfortunately guided by Neoclassic economics, and hence subject to Algorithmical reform. Considering the high discreteness and pluralities of knowledge systems, any deductive simulation based on only a few premises could be deemed insufficient to explain the realities, thereby the accumulation of empirical materials, and their filling into programs, become significant. An idea is that global socio-economic scholars could cooperatively and extensively collect empirical data and then build a giant simulative and comprehensive model. It might initially be impossible to build a complete model, but we can start with the most basic steps -- such as setting up various characters of

agents and then substantiating them with empirical data; preferentially simulating statics and constancies, etc. Establishment of the giant model will significantly improve the precision of economic prediction, and hence serve all kinds of actors, especially the law-makers and economic regulators.

Among all kinds of social activities, economic activities shall, according to common sense, refer to those using or closely relating to money. Based on the above Algorithmical statements, this traditional definition can now be deemed appropriate, which both connects and distinguishes economics with or from other social sciences, thus making a relatively independent domain for economists, allowing them both to inherit and to innovate. Obviously, any existing method – such as the theoretical, positive, normative, statistical, experimental, descriptive, historical, comparative, exemplary or other one -- shall continue to be used, once it is Algorithmically adjusted. At the same time, economics shall connect closer to other social sciences and humanities, where the unified principles, Algorithmically, bridge all the disciplines concerned.

V. Conclusion

The purpose of this paper is to explain that in order to reform economics, we need minimally to introduce a new thinking theory which, although very simple, clear and desirable, has been hidden in computer technology for a long time, and unfortunately missed by those who had being looking for new economic principles in this field – e.g. Douglas North[10]. AFT, as a surprisingly efficient catalyst, is enough to trigger a variety of strong chemical reactions among various schools and branches of economics, resulting eventually into a new whole body. When a simplest theory can explain the most extensive phenomena, it can positivistically be the most acceptable, even believed as the "truth". The unified economics and unified social science thus take shape, and the long-time pursuit of economists and social scientists since Methodenstreit is hopefully coming true.

Some readers may interrogate the word "minimally" above, questioning "why not introduce 'thinking time' only while razoring the concept of 'Instruction'?" The answer is: If so, it is not enough to explain the "Subjective Turn", or "Mental Distortions". It has always been philosophically believed that mankind has grasped a part of the truth since the beginning of history, and truth knowledge (e.g. sciences) is supposed to keep expanding until its accomplishment at the doomsday. Mainstream economics is apparently driven by this notion, thus it puts cognitive processes in an insignificant position. However, it cannot explain how mistakes, failures, imperfections and many other negative phenomena happen, nor can it explain why innovative momentums by far have not weakened, but seemingly accelerated. Explanation of all these phenomena requires us to treat human thinking as a process of interactions between innate, general and concrete thinking tools and information. This ancient transcendental thought bred into a modern successful paradigm viz. the computer technology. Now we just need to pick it up and use it for us. Why not?

Particularly, for economics, social sciences and humanities, the lifeline of their existences would be subjectivities rather than objectivities – It would certainly be better to integrate both. The topics such as market, democracy, freedom, power, imagination, etc. shall not be explained by

[10] Douglass C. North (1996).

mathematical functions. On the contrary, it is exactly because actors do not act abiding those fixed and mechanical formulas that certain socio-economic institutions need to be established, and thus economics, social sciences and social engineering need to be conceived. To a large extent, the demonstration of mainstream economics on the market economy had gone toward the opposite direction, the error further gave birth to other heterodox schools, and hence the disputes and confrontations happened and persisted permanently. Now, the correct solution should have appeared, presented by this article. This unitive framework is not only enough to pacify the existing disputes, but also paves a clear path for the development of economics, social sciences, philosophy and humanities in the new century, which is subject to further narratives in a broader scope.

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