The applicability of kuhnian paradigm in social science

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Abstract: The term paradigm is the basis for Thomas Kuhn's holistic view of science, and a precise definition and ontological description of the term is lacking. By combing through the classical literature, I argue that Kuhn saw the term paradigm as a particular form of reflection of the scientific community's response to puzzles, and that it can be well applied to the natural sciences. And the example of economics proves that this definition can be applied to the developmental models in the social sciences.

Key words: paradigm science development; kuhnian paradigm; social science

1. What is the Kuhnian paradigm

The concept paradigm emerged through a series of phases. About the embodiment of “incommensurability” in the paradigm, and the subsequent question of whether different paradigms can understand each other. Philosophers have made wonderful arguments about this paradigm. Cedarbaum(1983) claims that a paradigm is a technical axiomatic model, and Kuhn’s “scientific communities” are examples of thought collectives, and the term “thought style” might often be substituted for “paradigm” in Structure. Hoyningen-Huene and bird (2000) understood the paradigm from the perspective of the community and regarded the paradigm as the interaction between scientists, and the important role of role models in training scientists. Paradigms can provide similar personal intuitions. The concept of paradigm is so complex that it goes beyond Kuhn's text and narrative.

At the same time, his division of the two sciences is incomparably wonderful. But this article argues that we need to start with the example of astrology to understand Kuhn's demarcation of science, On the Growth of Knowledge in the Fields of Normal Science. Kuhn may think that the essence of science is a special mode of knowledge growth in the stage of normal science which is called “puzzles solve”. In the relationship between Kuhn and Karl Popper, both of them introduce falsifiability, criticism, and reflection, and regard science as an existence that constantly negates original assumptions to achieve development(mayo,1996). In this sense, intellectual successors may combine both views of science, emphasizing their historical perspective; the dynamic growth of science rather than the stability derived from logic; and the inherent critical tendencies of “falsificationism”.

But there is a fundamental disagreement between the two views of science, hidden in Kuhn's brilliant discussion of whether astrology is science. (Although this is a topic that is often discussed, it still does not receive the attention it deserves.)According to Kuhn, although astrology meets all the above characteristics, it still cannot be called a science because of the lack of “puzzles”. Astrology also makes predictions, which are cross-checked with empirical facts and will also face the situation that the predicted things did not happen (Development Models in Normal Science). But this situation is not called a “puzzle”. It will not cause reflection on astrology theory, observation means, tools and data calculation. At the same time, this kind of reflection is not “community”. There were too many sources of difficulty most of them beyond the astrologer's knowledge, control, or responsibility. Individual failures were correspondingly uninformative (Kuhn, 1970).

I think Kuhn is pointing out two properties of astrology here that make it unscientific:1. In the testing phase of normal science, even if astrologers encounter prediction failures, they will not be aroused to reflect on theoretical correctness, data processing methods, observation methods and tools. Which he called “scientific methods”.2. These reflections and difficulties are “individual” rather than “science community”.

I would like to conduct an in-depth analysis of these issues. At the same time, make an association with Lakatos' views on falsification. Lakatos argues that a single empirical fact cannot be used to test a theory as correct (Karl Popper has brilliantly demonstrated this), nor can it be used to falsify a theory. Theories are mutually supported, influenced and confirmed by each other. Even the “empirical basis” of the phenomenology of the observed may be accompanied by certain theoretical assumptions that remain unknown (gestalt theory and other psychological perspectives). Lakatos probably believed that the gap between empirical fact and theory could never be bridged (Lakatos,1976). If Kuhn and Lakatos' views are combined, we will rethink the relationship between science and falsification, as well as the scientific development problems brought about by falsification.

All human theories and thought systems, including alchemy, astrology, and science, have the function of prediction. They will all face the “problem” (Kuhn used “anomalies”) that what was predicted did not happen. Lakatos believes that a single empirical fact (about what was predicted) does not prove that a single theory is correct or not. What we understand as scientific reflection is logically incomplete. All “prediction systems” will face prediction failures, but scientists do not conduct so-called rational and complete reflections in the face of failures. (This past tendency to sanctify science through logical and rational completeness). This is what Lakatos has already argued: our reflections on empirical facts can never correspond exactly to empirical facts. And the difference between science and other forecasting systems may be this special reaction to the failure of forecasting. (Because all reflections are not a perfect match to empirical facts) I think this is descriptive, not the inevitable result of some logical deduction

Here, I interpret Kuhn's views on the Demarcation of Science. The essence of science is to reflect on the phenomenon of prediction failure and empirical facts as follows: The characteristics of the theory itself and its subsystem, including observation tools and calculation methods (cannot be exhausted). So that we can “learn” from reflection on failure to predict. And this learning process takes place across the science “community”. In summary, I involved Karl Popper and Lakatos to answer Kuhn's view of the demarcation of science: Kuhn believes

that science is a system of continuous “learning” in normal testing, in which the “community” plays the main role. (Astrology, alchemy, witchcraft, and other systems we call non-scientific may not meet these characteristics).

In conclusion, I have decided to suspend these controversial discussions about what a paradigm is, and its relationship to science and the science community. I interpret Kuhn: If a system can learn from “puzzles or anomalies” through a fixed paradigm that includes several specific aspects (including epistemological structural levels, data processing methods, and modeling tools), and This learning process is a community of scientists. The system is scientific. I agree that my interpretation of Kuhn can well explain the complex relationship between the demarcation of science, paradigm, normal science and scientific revolution.

2. Paradigm to hard science

some people see social science as a kind of soft science, They will try to analyze the conceptual evolution of social science concepts from the perspective of historical analysis, trying to find ontological existence（Goertz, 2012）. What I object to through the above arguments is this ontological tendency of science and paradigms. As I have already stated: a system is scientific if it: learns and improves the behavior of a community in a particular paradigm when faced with a puzzle.

For the applicability of paradigms in natural sciences (hard sciences), we can make a reference for our analysis of social sciences. In this analysis, the concepts of science, paradigm, community, and learning process are inseparable, they are different aspects of a polyhedron.

There are many excellent discourses, and even positivist analyses, on the use of paradigm concepts in the hard sciences. Kuhn himself analyzed the application of the term paradigm in physics. His analysis of astronomy showed some characteristics of paradigms: 1. Paradigms can affect the interpretation of observed objects, and the same astronomical phenomenon has completely different explanations (Gestalt theory); 2. Paradigms include basic theories such as geocentric theory and heliocentric theory. His discussion of Aristotle, Newton, and Einstein in the development of classical physics also demonstrates the existence of science communities within paradigms. Represented by Kuhn's analysis of physics, along with the fundamental transformation of the scientific enterprise by the term paradigm, the disciplinary review of historical analytical paradigms has appeared in almost all disciplines. Even in the study of medicine, the special function of a certain substance is called a paradigm and has gained great academic influence(MANTOVANI: 2012).

There is a lot of positivism research devoted to how much explanatory power the term paradigm has in science. Literature quantification can screen out important articles in a discipline by analyzing the co-citation mechanism and citation mechanism. These articles can be used as the introduction of important concepts, the transformation of basic theories, or the intervention of new research methods. The sudden increase in the citation rate of such articles can be regarded as a transformation of the focus of the discipline. And through the calculation and matrix construction of the co-authors, the existence of academic communities with different paradigms within a discipline can be depicted. There are 52 significant articles in the discipline of plate tectonics, dealing with both land and sea perspectives. Through co-citation analysis, these important articles can reveal the historical process of shifting paradigms in plate tectonics(Marx& Bornmann: 2012). This is also reflected in the distribution of “bigram” frequencies in forestry studies(Polsby: 1998).

In conclusion, the applicability of the term paradigm to the hard sciences is recognized by two themes:1. Qualitative description of the subject history method, represented by Kuhn's wonderful discussion on the development of physics. Quantitative calculation method (can be called Bibliometrics). This method is used in almost all hard science fields. This method finds key articles (These key articles are often about the introduction of new ideas, methods, and models to lead a new paradigm) by constructing citation and cited networks. Look for changes in research topics through etymological quantitative analysis (which can manifest as paradigm shifts). The collaborative network of co-authors is also blocky and corresponds to certain etymological themes. The superiority and explanatory power of the Kuhnian paradigm has been perfectly demonstrated in the quantitative aspects of the literature. Although exhaustive statistics are not available, the distribution laws of cited networks, citation networks, and co-author networks of articles in any hard scientific research field may conform to the predictions of the Kuhn paradigm for science.

3. Economics as a sample

Let's start with the initial state of economics, the earliest economics did not form a “paradigm”, mercantilism. Mercantilists, as pioneers, regard gold as value (This is the question that all economic paradigms must answer) and believe that the goal of economics is to make a country obtain the most gold. Soon the Physiocrats learned from the pioneers and believed that the quantity of agricultural products is the “value”, and the state should invest more.

But soon one of the most important postulates of economics arose in reflection on the Physiocrats. As the country's investment in agriculture increases, economists discover an important fact: the law of diminishing margins. Adam Smith Incorporate this law and see value as meeting individual needs. In a strict sense, he created the first paradigm of economics: classical economics. He regards value as the satisfaction of individual needs and regards the goal of economics as the exchange between such values, (due to the law of diminishing marginal utility proved by physiocratism, This exchange is possible). The measure of these exchanges is the price. The goal of economics is to maximize the exchange of value. As the first paradigm of economics, classical economics has established norms on what is value and how to maximize value. Soon, “the learning process for economists within the paradigm begins”(This article sees this process as an ontological formulation of the existence of paradigms). David Ricardo (whom I also consider a classical economist), took issue with value, He believes that value does not come from the satisfaction of individuals, but from the labor process. At this time, the moment of “crisis” proposed by Kuhn came.

The arrival of the first “crisis” moment successfully promoted the establishment of the second paradigm of economics. Ricardo realized that value comes from labor but did not deepen it. Marx reconstructed the value theory of labor and the entire economic paradigm.

According to Marx, value is undifferentiated human labor condensed in products, not the satisfaction of personal needs. This peak expression became the symbol of the establishment of a new paradigm of economics, this is Marxism. Marxism as a New Paradigm Discussing Labor, Capital, and Exploitation He constructed a new theoretical system based on the labor theory of value, including government and state. At the same time, his work is collective in nature, including the participation of Ricardo, Engels, Lenin and other economists.

So far, two basic paradigms of economics have been successfully established (each paradigm includes a consensus on basic issues, a learning process brought about by continuous reflection, and a community of scientists). However, classical economics is facing a second crisis, which has caused economists to reflect on the price mechanism. Economists solved “puzzles” by introducing marginal analysis. They realized that the analytical methods they thought could not explain the necessity of the price mechanism, A group of people represented by Bentham created the marginal analysis method. Jules Dupuit created the“demand curve” to describe the price mechanism based on the law of diminishing marginals in classical economics. In conclusion, Economists Solve the “Puzzle” of the Necessity of Prices by Inventing New Ways of Analysis.

The marginal school soon faced yet another crisis in the classical economic paradigm it defended: the prosperity predicted by economists did not materialize. The great Depression Begins, and no economist at the time could explain it. Unexplained phenomenon re-emerges learning and paradigm shift. Keynes realized the following facts to establish a new paradigm: consumption will increase with income, but the correlation coefficient is less than 1, and investment is related to money interest and has a multiplier effect. With this, he established a new paradigm that could be called Keynesian. This paradigm recognizes that state intervention and investment are necessary, and are embedded in the economic law of the consumption function. Samuelson Revised Keynesianism explored new research methods, introduced mathematical analysis into economics, created a method of comparing static analysis and dynamic analysis, and truly turned economics into an empirical science. His research on the relationship between national investment and the unemployment rate also answered Keynesianism.

Just as Kuhn predicted, Keynesianism as a paradigm also faces “puzzles”. This crisis came from Friedman’s “learning” and reflection on the consumption function proposed by Keynes. In Friedman's view, the income that determines consumption can be understood as long-run income over income expectations, which challenges the assumptions that are the cornerstone of Keynesianism. But this time the results of puzzles and learning, it is difficult to define whether a new economic paradigm has been formed because it is a revision of a single theory, rather than a fundamental change of a system or a framework.

I use a very brief analysis of the history of economic science to illustrate paradigm theory proposed by Kuhn can effectively explain the development of economic "science". This article understands paradigm as communities of scientists learning from puzzles around some specific problem. The earliest economics, which can be called a paradigm, is Adam Smith's classical economics. Its specific problems include whether value meets the needs of individuals and "learning" the law of diminishing margins from the Physiocrats. Ricardo proposed labor in response to this puzzle, and Marx created a new "paradigm" by deepening the fundamental point of view of labor value. The "paradigm shift" occurred from Marx's "learning" from Ricardo and Adam Smith, and crisis resolved. The “puzzle” of the necessity of the price mechanism in classical economics was also solved by community of later scientists(Bentham and Dupuit). The "crisis" that classical economics could not explain the Great Depression was solved by Keynes with the consumption function and achieved a new paradigm transformation. Keynesianism also faced the “puzzle” of the relationship between income and consumption.

In summary, paradigms apply to economics. It makes sense in this article to see paradigms as communities of scientists learning from puzzles around some specific problem. Concepts such as scientific crises, paradigm shifts, and puzzles proposed by Kuhn also apply to economics, which represents the whole social science.

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