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Constructive Methods in Economics

Abstract
Constructive methods and constructivity have been under extensive discussion in the philosophy of science. In mathematics and experimental sciences, constructive methods have a long tradition. From experimental sciences, constructive methods broadened to empirical sciences, as constructive empiricism demonstrates. For the last few decades, scientists from social sciences have been discussing social constructionism, which is a new direction in this multidimensional tradition of constructive methods. In economics, mathematical methods such as game theory are generally used. The mathematisation of science can be done in the spirit of the pedagogic-scientific mode or technocratic-scientific mode, which both are present in economics. Mathematical and other constructive methods may allow us to find out scientific understanding for particular phenomena. However, there is a real danger that the whole of science becomes technocratic. The question is not about constructions, but the whole aim of science – whether it is pedagogical or not.

Keywords
constructive method, exactness, mathematisation, pedagogical approach, scientific approach, economics

Introduction

What do we talk about when we talk about constructive methods? There is no single complete answer to the question. Someone maybe has in mind the so-called *social constructivism* or *constructive learning theories*, as they have been very popular in recent decades. However, it is not easy to understand what kind of constructions there are in social constructionism or constructive learning theories. The concept of *construction* is not the same in these approaches. Hence, the concept of constructionism is relative to the underlying concept of construction.

Someone else maybe has in mind the experimental science, whose paradigmatic example is physics. An experiment is a crucial sequence of steps in knowledge generation whose role remains hidden in the hypothetic-deductive model of science. Experimental science is not just making bold guesses and criticising them, strongly as Karl Popper, amongst others, has argued. In fact, an experimental method is a constructive method proper: a scientist explicitly constructs new knowledge through experiments (Hintikka 2007; Heidelberger 2003).

We might also have in mind mathematics, which is a source of many different kinds of constructive ideas. It might be said that mathematics is the most constructivist of all the constructive sciences. The concept of construction in mathematics has been a paradigmatic example in science and has its origins in geometry, where it has an exact connotation. In geometry, the constructive method, which has been in use since the time of the ancient Greeks, has been part of the knowledge-seeking process. Geometrical constructions are built-up mathematical objects that are "known" or simply "given". This means that the constructions are built up in such a way that the construction process is a learning process in which the construction constructs the intended knowledge (Bos 2001, 3). This makes sense of the original Greek meaning of the word *mathematics* as "something that has been learned or understood" or "acquirable knowledge" (Bochner 1966, 24–25).

What do constructionists actually construct, whether they are social constructionists or any other kind? It is important to ask about the products of construction processes. However, it is not enough to ask about the products. We have to ask about the methods of construction and the building bricks of constructions. The intention of these kinds of questions is not to cast doubt on the whole approach of constructionists – it is to understand the true character of the construction processes properly. These sorts of questions are very natural and are worth asking. However, they are quite easy to answer if we are constructing concrete objects, such as a violin. But when we are constructing abstract things like scientific knowledge, the situation becomes more complex. Such questions should be understood as constitutive questions.

The intention is not to be merely critical, and it is to study the very important topic more closely. Constructive philosophy is an essential part of the present-day philosophy of science. The historical roots of the constructive methods go to the very roots of Western science. Moreover, the spectrum of the different kinds of constructive approaches is enormous. Because of the multidimensionality of the concept of construction, the very idea of constructivism is extremely complex.

Constructive methods in mathematics

It is commonly accepted that "[m]athematics is an exact science" (Bos 2001). However, this general agreement does not give much knowledge about the character of mathematics; the concept of exactness is far from clear. Unfortunately, the concept of construction is closely related to that of exactness. A present-day reader may think that exactness refers to the formalism of mathematics: merely formal symbolism characterises the concept of exactness. In fact, this is not only a hypothetical idea. For example, logical positivists conceptualised exactness and formalism. But the more substantial question about the concept of exactness "[t]hroughout history mathematicians have repeatedly raised (…) and reshaped their science to meet more appropriate and higher standards of exactness" (Bos 2001, 3).

To achieve a more appropriate concept of exactness, we must consider the idea of exact construction in geometry, as was done by Descartes. He worked with the "philosophical analysis of the geometrical intuition" (Bos 2001, 409). To do the task, he had to explicate the concept of exactness in mathematics, which is of central importance in mathematics and the philosophy of mathematics. The concept does not refer merely to technical precision, which of course has been an essential part of mathematical development. The foundational work of Descartes in geometry was an essential step in the philosophical-conceptual foundation of mathematics in general and that of calculus.

During his studies on the notion of exactness, Descartes developed algebraic methods in geometry, which enabled the later development in mathematics. However, the development was not simple and fast. The long tradition of geometrical thinking was developed as logically and conceptually strict and precise thinking in Ancient Greece. The geometrical tradition was gradually substituted by algorithmic thinking during the development of the calculus. Even if the algorithmic approach was more formal and abstract, it was not logically-conceptually developed as the earlier geometrical approach[1] (Lehti 1969; Boyer 1949).

In mathematics, as well as in Western science more generally, there has been a tension between pedagogical and scientific approaches. The pedagogical approach is connected to Plato and the scientific approach to Parmenides. The Parmenidean approach emphasised the concept of truth, and the pedagogical approach emphasised learning and becoming a better human. The development of calculus explicates the tension between the pedagogical and the scientific understanding of mathematics: the scientific approach emphasised the formal character of mathematics, and the pedagogical approach emphasised the reasoning process as a learning process, which was demonstrated in Plato's *Meno*. The tension became evident when modern experimental science began to flourish. The tension is ubiquitous, and hence, it can be only indirectly recognised. Hence, it is a kind of "ultimate presupposition" which is not "a consciously chosen position" (Hintikka 1997, 215). We will see that the mathematisation of science is not an unambiguous process. Thus the tension remains hidden. The analysis of the notion of construction shows the conceptual sensitivity of the topic.

The scientific approach in mathematics emphasises its formal character, which implies that its pedagogical and dialogical character are retrograding. At the same time, in mathematics, the emphasis turns from geometric thinking to algorithmic thinking. The distinction between geometrical and algorithmic thinking shows that 'logical-conceptual' and 'formal' are different concepts. Ancient Grecian geometry was strictly logical but not formal, and sixteenth-century calculus was formal but not strictly logical. Of course, present-day mathematics is both strictly formal and logical; calculus is a good example of this.

In analysing exactness in mathematics, Descartes realised that logical manipulation of geometrical figures could be transformed to the manipulation of algebraic formulas, which was central to the transformation mathematics from analysis of geometrical figures to the formalisms (Bos 2001; Hintikka 1973, 212). The formal character of mathematics – or the idea of calculus – has far-reaching consequences. The character of constructions is not so obvious anymore, rather, the calculative manipulation of symbols without interpretation becomes a mainstream mode of mathematics.

Present-day mathematical analysis is very often based on Calculus, because it behaves like a calculus, i.e., a formal structure that can be interpreted and reinterpreted. However, the most important thing is that while generating and solving problems there is no need to specify the interpretation. The problems can be generated and solved without specifying what problems are generated and solved. Of course, the problems and solutions generated in this way are

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Of course, present day calculus is a logically strict mathematical theory.

theoretical and empirical application presupposes (factual) interpretation of the calculus (Russell 2009, 209–210). It is especially important for the methodology of experimental sciences; for example, measure theory is a branch of calculus. Thus, sometimes the criticism against the use of mathematical methods seems to be justified.

It is interesting to consider how formalization has been done in logic. Russell was a leading logician and philosopher in his time, which was the golden age of logic. Moreover, he was one of the first who formalised logic and logical reasoning precisely. At the same, he was deeply rooted in history. For example, he did not understand logic as calculus but as a language; logic was like a (natural) science speaking about reality (Russell 1993; van Heijenoort 1967; Kusch 1989; Haack 1978; Hintikka 1997).

Russell (1993, 73) separated constructive definitions from (mere) postulates, and elsewhere he spoke about logical constructions, for example, in Russell (1998). However, Russell did not develop constructions or constructive methods in a proper epistemic way, only as formal logical constructions. However, Russell's influence was not restricted to logical positivism or analytic philosophy; it was very wide, and can also be seen within social constructionism (Hacking 1999).

Carnap (1969, 5) shows how an individual constructs their knowledge from the phenomena. The book establishes a "constructional system" which is "an epistemic-logical system of objects or concepts". By a constructional system, he meant "a step-by-step ordering of objects in such a way that the objects of each level are constructed from those of the lower level". A reason why the book does not have more influence in the constructive philosophy is that it is written in the spirit of logical positivism, as reductive constructions show.[2] Carnap is associated with logical positivism, which makes the book even more forbidding.

The constructions of Carnap (1969) are logical reductive constructions. Carnap was strongly connected to the scientific approach. At the same, the pedagogical approach remains in the background. The book is quite a formal one, in which a logic of knowledge generation is expressed without any explicit reference to the proper subject or dialogical mood of the learning process. Thus, it is quite understandable that the influence of Carnap's book in this respect remained quite thin.[3] Of course, it has its place as a classic text in philosophy (of logical positivism).

More generally, mathematics and logic were mainly used within the analytic tradition and its precursor logical positivism. This, of course, made logic and logical constructivism and even mathematical methods undesirable within so-called qualitative research. In fact, this is quite a sorrowful news. Mathematical methods have no direct negative consequences as sometimes has been expressed; moreover, mathematical and logical methods are not connected merely to logical positivism. Even if mathematical methods are usually connected to the scientific approach, there are still open methodic approaches which are rich in content and dialogical in nature. The tradition started with Socrates and Plato. It is still present in geometrical thinking (Hintikka and Remes 1974).

The tension between pedagogical and scientific approach has been present during the whole history of Western science. The present-day spirit in science has emphasised the scientific approach, and mathematics and logic have had a strong role in this. Mathematics can be seen as a paradigmatic example of science in the scientific approaches which emphasise objective and impersonal moods. This makes it pedagogically challenging: the objective, impersonal moods emphasise the formal character of scientific knowledge, i.e., universal knowledge without knowing the subject. This is emphasised, for example, by Popper (Popper 1972, Ch. 3). However, knowledge is always personal; *somebody* must know it, which differs from Popperian scientific knowledge.

The objective knowledge becomes knowledge that is coded into scientific books and journals. And, as such, it is collective property, not a part of personal character. In fact, this is part of the dialectic of Enlightenment, i.e., that the Enlightenment has the seeds of its destruction inside it (Horkheimer and Adorno 1972). In this case, the seed of destruction is an interpretation of objectivity, which excludes pedagogical dialogue: objective science is a search for new knowledge as such – that is, the intention is not to cultivate but only to increase the amount of scientific knowledge. The increase can be seen, or even measured, by the huge amount of new publications. The emphasis contradicts the intention of the Humboldtian conception of the university, which was essentially pedagogical (*Bildungdurch Wissenschaft*; von Wright 1989).

Constructivism as a pedagogical approach

Present-day pedagogical discussions about constructive learning theory emphasize the learner as an active knowledge constructor. The learner is not an object of teaching – information entering. The learner is an active agent who searches actively for knowledge. The role of teachers is to help the learner in the search for knowledge. Naturally, a teacher cannot transfer knowledge into learner's mind, which was recognized by Socrates who said in Plato's dialog *Symposium* that it is not possible for wisdom to "be infused by touch, out of the fuller the emptier man, as water runs through wool out of a fuller cup into an emptier one"; the learner must learn by themselves. The roots of constructive learning theory go back to Vygotsky, Piaget, and Dewey.

The roots of the constructive theory are in psychology and philosophy. Both are relevant and important, but for characterising conceptually constructive learning, we also need the logic of knowledge acquisition, whose roots are also in philosophy. One of the most important sources in which learning has been characterised as a constructive process is Plato's dialogue *Meno* in which he characterises the teaching-learning relationship as a dialogical process. The dialogical character of the construction of knowledge is a fundamental principle of the Western Enlightenment. The cultivation of a human being is deeply social – cultivation is always relative to other people, or to human society as a whole.

In *Meno*, Plato characterises a logic of learning as a dialogical process that is a process of deepening the understanding. The characterisation is subjective in the sense that it gives a logical-conceptual characterisation of the learning process of an individual. It is objective in the sense that the characterisation gives a structure of the learning process. Thus, the characterisation is general and it can be applied from elementary learning to scientific research. In

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Achinstein (1977, 351) calls Carnap's view reconstructionism, which he characterizes as follows: "The Constructionist wants to 'tell it like it is'. The Reconstructionist wants to 'tell it like it should be'." (Achinstein 1977, 350–351)

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Of course, Carnap's influence is very important in philosophy and in science.

the literature, there are general philosophical models, so called interrogative models, which are the present-day formulations of the model (e.g. Hintikka 2007; Jung 1996).

The social aspects of dialogical processes remain, largely, untouched in *Meno* and within interrogative models. They characterise an individual's learning processes. Sociological theory of knowledge was considered in Peter Berger and Thomas Luckmann's *The Social Construction of Reality*, published in 1966. It is still important and was the foundation for present-day constructivist approaches. The focus of the book is on sociological aspects of learning, on how learning processes are dependent on sociological factors. Beside this, there are also studies of collective learning, or of collective knowledge, which are generalisations of individual learning (e.g. Hendricks and Rendsvig 2016).

Berger and Luckmann (1966) considered the sociological theory of knowledge, i.e., the sociological foundation of our knowledge generation. This is a very important area of study. Humans are social animals; whatever we do, we do it within society. Humans construe societies but, at the same, humans are constituted by societies. For example, the knowledge and achieving knowledge are not as individualistic as sometimes they are assumed to be.

Berger and Luckmann (1966, 7) say that "a phenomenological analysis of the reality of everyday life can be understood "as philosophical prolegomena to the core argument" of the book. It is interesting to note that Berger and Luckmann (1966) characterise phenomenological analysis as the foundation of their approach. In this, they have a parallel approach just as Carnap had in his *Aufbau*. This single detail is more than any single, isolated detail. This kind of phenomenological foundation was generally accepted in the early decades of the twentieth century. Philosophers such as Moore, Russell, Carnap, Husserl, and Wittgenstein advocated the personal approach. However, the approach was not restricted to some school of philosophes but was more generally accepted (Hintikka 1975).

How generally phenomenology was accepted as foundation among constructionists is, of course, an interesting philosophical question, but we will not consider it more closely.[4] However, there are interesting connections between constructionism and mathematical constructionism (Hacking 1999), which show that philosophical approaches are multidimensional and that they have different kinds of interconnections. The phenomenal foundation and explicit concept of construction make the constructivism extremely interesting topic of study.[5] For us, it is not a central problem to study the interrelations between different philosophies but to analyse the relation between the scientific and pedagogical approach to scientific inquiry.

The present-day discussion about constructions has different kinds of roots. Of course, the Enlightenment plays a role in it. But the Enlightenment is not a single, unique tradition. It includes both the "scientific" and "pedagogical" tradition, which caused the dialectic of Enlightenment (Horkheimer and Adorno 1972). The dialectic is present also in constructivism. There are scientific constructive approaches (Latour 1993) and pedagogical constructive approaches (Berger and Luckmann 1966). The scientific approach is closely connected to phenomenology or science studies.

The concept of construction has many historical roots. As mentioned, a central source of the concept in mathematics in which the roots of constructive methods go to Ancient geometry. Geometrical analysis in antiquity was strictly logical, but was at the same very concrete; geometrical constructions were concrete pictures in which the searched results were explicitly seen. This gives, at the same, pedagogical foundation for mathematical construction as Plato's *Meno* demonstrates.

At the seventieth century, Descartes formulated foundations of called analytic geometry, which changed the analysis of geometrical figures into manipulations of the algebraic equations. Hence the drawing and analysis of geometrical figures were changed to algebraic computations. Eventually, this entailed that the analysis, and the constructions, became more abstract and formal. However, the increased formal character does not imply that mathematics would become more logical, as the history of calculus at the seventeenth-century shows (Boyer 1949). Nowadays, mathematics is understood as formal, abstract and strictly logical. Sometimes these ideas are identified, which implies that mathematics is understood as a merely technical or computational topic. In science, mathematisation has meant usually the increase of scientific approach.

The present-day discussion about constructions is, of course, part of the historical continuation of science. Historical roots of present-day constructive thinking are manifold. One line of historical roots goes to mathematical thinking; in empirical psychology, the emphasis on Russell's thinking has been recognized (Hacking 1999, 43). We are not interested in how much certain philosopher or certain scientist has influenced to constructivism. The idea is here to see that the multitude of impacts is a real situation. Constructivism has root in "pedagogical" but also "scientific" line of thoughts.

Economics

Economics has a long history. Adam Smith, one of the founders of economics, was more a philosopher than a scientist, and his book *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776) is a very philosophical analysis of the topic. The book builds on his earlier work *The Theory of Moral Sentiments* (1759), itself a study in moral philosophy. Karl Marx's *Das Kapital: Kritik der politischen Ökonomie* (Marx 1867) is focused on "political economy" similarly to Smith's *Wealth of Nations*. Before *Capital*, Marx published several philosophical works. His *Economic and Philosophic Manuscripts* of 1844 were very philosophical, but the topic was not a moral philosophy but social philosophy. The manuscripts were a source of inspiration for so-called Western Marxists. Both *The Wealth of Nations* and *Das Kapital* are very philosophical works but are also full of factual details. The background of economics is in philosophy, as it is also in the natural sciences, but the difference is that in economics the background is in moral and social philosophy, not in natural philosophy as it is in the natural sciences. That is, the background of economics is in so called practical philosophy and natural sciences in theoretical philosophy.

The scientification process in economics took place in the 20th century which implied that the basic questions in economics became less philosophical and

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In constructivist approaches, phenomenology is seen as an alternative approach to the positivism. They refer, for example, to Schütz (1972) and Garfinkel (1984) as is done in Schwandt (2003). This line of argumentation has some justification.

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Phenomenology was quite popular in the late 1800s and early 1900s.

more closely connected to the general problems in science which can be seen from the textbooks of the philosophy of economics (see, for example, Redman 1991; Hausman 2018). As in natural science, in economics the scientification mean mathematisation. However, in natural science the mathematisation was rather methodological development: the logic of experimentation presupposes mathematical conceptualization (Hintikka 2007; Hintikka and Remes 1974). In economics, the reason was partly external or even political (Redman 1991).

It is interesting to note that mathematisation of natural sciences is connected closely to the development of mathematics (see, for example, Klein 1968). For example, Isaac Newton was one of the key founders of calculus (Boyer 1949). The development of mathematics and the development of natural sciences were not two parallel processes, but rather a single process in which there are two aspects, as the discussion about Descartes showed. In economics, the development was different. According to Hausman a central work in mathematical economics is Milton Friedman's essay *The Methodology of Positive Economics* (1966), where he makes a sharp distinction between positive and normative economics by employing Hume's guillotine:

"Positive economics is in principle independent of any particular ethical position or normative judgments. As Keynes says, it deals with 'what is', not with 'what ought to be'." (Friedman 1966, 4)

The role of Hume's guillotine is to emphasise the distinction between facts and values, and, moreover, to underline the value-free science. Science is a task of empirical facts, explanation, but also prediction. Friedman emphasised the role of prediction:

"The ultimate goal of a positive science is the development of a 'theory' or 'hypothesis' that yields valid and meaningful (i.e., not based on truisms) predictions about phenomena not yet observed." (Friedman 1966, 7)

The idea of "scientification" is to rationalise the scientific processes. But as Latour (1993, 119) says that rationalisation is not a simple task to do. That is, mere mathematisation is not enough, and, moreover, mathematisation is not even necessary to rationalise the scientific process. In present-day science, mathematics is a fundamental methodological tool, both in the natural sciences and in the social and human sciences. Still, there is a danger for technocratic orientation in science: The role of mathematics as a methodological foundation and our understanding of mathematics as a technical topic entail that the idea of construction has technocratic connotation. For example, in natural sciences, it is quite usual to support instrumentalism (Giere 1988), or in economics to understand science (purely) descriptively or (merely) as a game. This technocratic emphasis makes the pedagogical aspects of sciences vanish, which is a loss not only to the human sciences but also to the natural sciences (Redman 1991).

Mathematisation in economics has taken place, for example, via the game theoretical approach. Game theory has been a very fruitful methodological tool in economics, and also in other social sciences. However, game-theoretical methods can be understood as heuristic tools (von Neumann and Morgenstren 2004, 7) or as an analytic tool (Eichberger 1993). The intention is to characterise a methodical tool that gives a strict formal calculus that can structure the study of economic behaviour.

The real meaning of game theory, or other mathematical or logical theory, in economics is difficult to characterise. Von Neumann and Morgenstern (2004,

xxxi) say that the "methodological stand" they are following comes from "theoretical physics". This is a very interesting characterisation; it is obvious that von Neumann and Morgenstern knew very well what physics and theoretical physics were. Physics is primarily an experimental science, and the purpose of mathematical tools is to characterise the experimental knowledge acquisition processes. Moreover, calculus is an extremely effective tool that allows us to solve and generate problems quite freely from experimental restrictions. In physics, there is a long tradition of communication between theoretical and experimental physics. Still, theoreticians generate problems that experimental physicists cannot test (Bos 1993; Boyer 1949).

The game theory is a formal, well-defined logico-mathematical theory in which it is possible to generate new kinds of games and to study their properties. As von Neuman and Morgenstern characterises these games can be compared to empirical facts and so, the games can be seen as "plausible schematizations" that truthfully picture economic behaviour (von Neuman and Morgenstern 1944, 2). The reference to theoretical physics shows that the intention is to understand the game theory as a calculus.

Game theory allows us to construct a formal model of economic behaviour step by step, and hence to show dynamics of the objects of study. However, constructed games are merely formal structures that have structural similarity with real economic behaviour. Such a mathematisation has both philosophical and practical reasons (Redman 1991). This does not imply that there is something wrong with mathematisation, but certainly, it emphasises the scientific approach, which hides the pedagogical, and also the practical and moral aspects of the topic. The fact that economics is in many ways connected to society might disappear (Stern 1990).

In economics, there is a proper need to use several kinds of methods; in this sense, economics is connected to all the sciences (Hausman 2018). Some methods are mathematical, and some are not. Stern (1990) shows that the general question presupposes that humanistic and pedagogical questions are taken into consideration, implying that it is possible to take under consideration all the different domains of society. Maybe in social constructivism, such questions are more often taken into account, but no approach in science can escape the scientification. In the constructive approach, pedagogical approaches have also been emphasized, as is the case with Berger and Luckmann (1966), but scientific approach has also been emphasised, as in Latour (see also Niiniluoto 1999, chapter 9). Here we can see that the distinction between pedagogical and scientific approach is a kind of ultimate presupposition which is not consciously chosen. Fortunately, it can be shown by detailed philosophical analysis.

Closing Words

In the criticism of mathematisation and rationalisation, a central concern is to emphasise that rationalisation (and mathematisation) of science is extremely complex (Latour 1993, 119). There is no reason to avoid mathematical methods in science, whether in natural or social sciences. Mathematical and other constructive methods may allow us to find out far-reaching truths about the object of the study. However, there is a real danger that the whole of science becomes technocratic. The question is not about constructions, but about the whole aim of science. Science is not merely a competition in which the winner is whoever does the largest number of scientific results; it is about how we generate deeper humanity in our society. Hence, even though it is important to consider constructions in science, it is even more important to ask about the final goal we humans are aiming for. Is reality like a cosmos, or like a resource for production in commercial competition? No science can give a final answer to this; we have to deliberate over questions like these and search for sustainable answers.

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Konstruktivne metode u ekonomiji

Sažetak

Konstruktivne su se metode i konstruktivnost intenzivno razmatrali u filozofiji znanosti. U matematici i eksperimentalnim znanostima imaju dugu tradiciju. Od eksperimentalnih znanosti proširile su se do empirijskih znanosti, kako konstruktivni empirizam i pokazuje. Posljednjih desetljeća znanstvenici iz društvenih znanosti bili su raspravljali socijalni konstruktivizam, što je novi smjer u ovoj višedimenzionalnoj tradiciji konstruktivne metode. U ekonomiji, matematičke metode, poput teorije igre, općenito se koriste. Matematizacija znanosti može se provoditi u duhu pedagoško-znanstvenog ili tehnokratsko-znanstvenog načina rada, a oboje su prisutni u ekonomiji. Matematičke i druge konstruktivne metode mogle bi nam omogućiti iznalaženje znanstvenog razumijevanja za pojedine fenomene. Međutim, postoji stvarna opasnost od pretvaranja čitave znanosti u tehnokratsku. Ne radi se o konstrukcijama, nego o cjelovitom cilju znanosti – je li pedagoški ili nije.

Ključne riječi

konstruktivna metoda, egzaktnost, matematizacija, pedagoški pristup, znanstveni pristup, ekonomija

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Konstruktive Methoden in der Ökonomie

Zusammenfassung

Konstruktive Methoden und Konstruktivität wurden in der Philosophie der Wissenschaft ausführlich diskutiert. In der Mathematik und den experimentellen Wissenschaften haben konstruktive Methoden eine lange Tradition. Von den experimentellen Wissenschaften weiteten sich konstruktive Methoden auf empirische Wissenschaften aus, wie es der konstruktive Empirismus zeigt. In den letzten paar Jahrzehnten haben Wissenschaftler aus den Sozialwissenschaften den sozialen Konstruktionismus diskutiert, der eine neue Richtung in dieser mehrdimensionalen Tradition der konstruktiven Methoden darstellt. In der Ökonomie werden im Allgemeinen mathematische Methoden wie die Spieltheorie verwendet. Die Mathematisierung der Wissenschaft kann im Geiste des pädagogisch-wissenschaftlichen Modus oder des technokratisch-wissenschaftlichen Modus durchgeführt werden, die beide in der Ökonomie präsent sind. Mathematische und andere konstruktive Methoden können es uns ermöglichen, wissenschaftliches Verständnis für bestimmte Phänomene herauszufinden. Es besteht allerdings die reale Gefahr, dass die gesamte Wissenschaft technokratisch wird. Es geht nicht um Konstruktionen, sondern um das gesamte Ziel der Wissenschaft – ob es sich um ein pädagogisches Ziel handelt oder nicht.

Schlüsselwörter

konstruktive Methode, Exaktheit, Mathematisierung, pädagogischer Ansatz, wissenschaftlicher Ansatz, Ökonomie

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Méthodes constructives en économie

Résume

Les méthodes constructives et la constructivité ont fait l'objet de discussions approfondies en philosophie des sciences. En mathématiques et en sciences expérimentales, les méthodes constructives ont une longue tradition. Des sciences expérimentales, les méthodes constructives ont été élargies aux sciences empiriques, comme le démontre l'empirisme constructif. Au cours des dernières décennies, des chercheurs en sciences sociales ont discuté le constructivisme social, ce qui représente une nouvelle direction dans cette tradition multidimensionnelle de méthodes constructives. En économie, les méthodes mathématiques, comme la théorie des jeux sont *généralement utilisées. La mathématisation des sciences peut être fait dans l'esprit du mode scientifique-pédagogique ou du mode scientifique-technocratique, qui sont tous deux présents en économie. Des méthodes mathématiques et autres méthodes constructives pourraient nous permettre de découvrir une compréhension scientifique de quelques phénomènes particuliers. Cependant, il existe un danger réel que toute la science devienne technocratique. Il ne s'agit pas de constructions, mais de l'objectif de la science dans son entier – s'il est pédagogique ou non.*

Mots-clés

méthode constructive, exactitude, mathématisation, approche pédagogique, approche scientifique, économie