4 Methodology and research methods

> What methodology can do is to set the criteria for the acceptance and rejection of research programs by setting standards. These standards are hierarchical, relative, dynamic, and by no means unambiguous in the practical advice they offer to working economists.
>
> (Blaug, 1980, p. 264)

> The scientific method is a kind of elephant; this is something that can be described, which exists, but cannot be defined.
>
> (Robinson, 1962, p.25)

The notion of methodology

Methodology (from Greek *methodos* – path, way of gaining knowledge, *logos* – science) represents a branch of logic that deals with the validity of applying scientific methods in the individual concrete sciences.

Every science should adhere to certain general methodological procedures and principles. In this sense, the general logical and methodological rules apply equally to all sciences.

Methodological aspects

Methodology pays particular attention to logical, technical, organizational and strategic aspects:

a) Logical aspects include all the rules related to defining concepts, constructing definitions, creating classifications and typologies, drawing conclusions and evidences, as well as the procedures referring to the hypotheses and theories testing.
b) Technical aspects imply the use of all those special techniques by which science seeks to acquire knowledge (observation, interview, survey, experiment, comparison, use of statistics, use of historical sources, etc.).
c) Organizational aspects refer to those methodological rules that include the most optimal organizational forms of scientific work, the communication and

exchange of experiences among researchers, and the teamwork skills in the process of research, etc.

d) Strategic aspects relate to setting clear long-term theoretical objectives and the realization of practical conditions for their achievement.

Scientific methods

For a clear perception of the term research, one must comprehend the meaning of the scientific method. The two terms, research and scientific method, are closely related. Scientific methods and techniques are the common feature of all research, although they may vary considerably from one science to another. 'Scientific method is the pursuit of truth through logical considerations, i.e. it attempts to achieve an ideal combination of experimentation, observation, logical arguments' (Ostle and Mensing, 1975, p. 2). 'Scientific method refers to a standardized set of techniques for building scientific knowledge, such as how to make valid observations, how to interpret results, and how to generalize those results' (Bhattacherjee, 2012, p. 5). The scientific method should meet four criteria:

a) *Replicability:* This criterion implies the possibility of repeating a scientific study and obtaining similar, if not identical, results.
b) *Precision:* Theoretical concepts must be defined with such precision that others can also use them as definitions for measuring those concepts and test theories.
c) *Verifiability:* A theory must be stated in a way that it can be tested. Theories that cannot be tested are not considered scientific theories.
d) *Simplicity:* When there are several explanations of a phenomenon, scientists must always accept the simplest and the most logical explanation.

Both the natural and social sciences have in common the fact that they are based on the same logic of the scientific method. Truthfulness is proved empirically, and the empirical method is based on its practical applicability in society.

The use of the scientific method is the most important tool in the study of the social sciences, as it allows us not only to learn lessons from certain social sciences, but also to understand their synthesis as well (Figure 4.1).

The limitations of the scientific method in economics and business

Despite the fact that the scientific method has found great applicability in economics and business, its possibilities are very limited when predicting future economic developments. This opinion was confirmed by the French philosopher Peirce, who concluded that no new ideas have been derived from analysis of the past with the help of inductive and deductive logic, the two forms of logic used in modern scientific methods (Martin, 2011). Some predictions have recently proved to be completely wrong. However, starting from the fact that any kind of

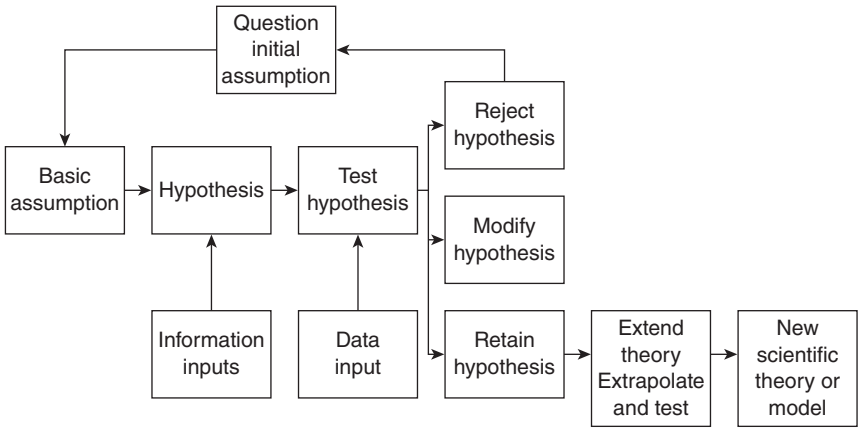

Figure 4.1 Steps in the scientific method (source: http://www.pixbam.com/steps-of-the-scientific-method/the-6-steps-of-the-scientific/110413)

prediction is better than nothing at all, governments of modern states and large corporations insist on the projections of conjectural developments. They are dealing with predictions of employment rates, inflation rates and the increase or decrease in the gross domestic product; almost every aspect of strategic enterprise management refers to the future: from planning the production of goods and sales to business expansion, or the opening of a new organization. Nevertheless, these future predictions by economists have long been very limited in certain segments, given that some aspects related to other social sciences were not taken into account. However, in recent years, things are beginning to change owing to those scientists who are bringing down the barriers between scientific disciplines (Ioannides and Nielsen, 2007; Poli, 2014).

Accordingly, the possibilities of anticipation from climate change to economic crisis are discussed in scientific circles. Predictions are particularly associated with a high degree of risk of their failure to comply in a time of economic crisis. The problem lies in the fact that

> in terms of fundamental uncertainty, the expectations cannot be understood as a result of the calculated optimal choice, taking into account all available information, but are based on the potential interpretation of a situation in the context of prevailing institutional structures, cultural patterns and social network.
>
> (Beckert, 2013, p. 325)

These considerations are bringing together researchers from different scientific disciplines, with the aim of establishing an interdisciplinary dialogue that should

serve as a basis for understanding and creating the policy of future decision-making. A better and more complete understanding of future trends and their effects will improve theories and models in economics and the other social sciences. These improvements will greatly benefit those who explicitly seek to create a 'ready society'. In this way, modern technologies will be used more efficiently and the limits of human endeavour will be explored (Poli, 2014); in addition, the response to the challenges of global society will improve.

The difference between methodologies and methods

Although there are a number of scientific disciplines, and within them an even greater number of different types of research, the methodology has, as a universal science (i.e. metamethodology), defined certain standards and rules that apply to each scientific project and each scientific research. However, the method is a way of research that is being applied in a particular science. Namely, the method of a certain science is the way this science observes or investigates the phenomena and processes that are important for the object of study.

During their existence, the social sciences have demonstrated a much greater number of problems and contradictory relations between their theories and empirical facts than the natural sciences. These significant differences arise primarily from the diversity of the very objects of study, but they also stem from the differences in methodological possibilities. The social sciences cannot use the methods and research procedures of the natural sciences to the same extent and in the same scope. This particularly refers to the most frequently used and most reliable experimental methods. There are clear ethical and methodological limits in the application of experiments in the social sciences.

The classification of scientific methods

Within the literature, the systematization of scientific methods is most often done in several groups:

a) *basic methods:* these involve analysis, synthesis, abstraction, concretization, specialization, generalization, deduction, induction, etc.;
b) *special methods:* the most important include positivism, historicism and the dialectic method;
c) *general scientific methods* (these are applied or can be applied in all the sciences): they include statistical methods, axiomatic methods, modelling methods and comparative methods;
d) *methods of data collection:* the following stand out: test methods, methods of observation, experiment methods, method of document analysis and case study methods;
e) *methods of data processing:* these represent the modalities of the application of general scientific methods or their extensions.

Basic methods

The most frequently applied methods of scientific research are:

a) inductive and deductive methods

   i) methods of description
   ii) analysis and synthesis
   iii) abstraction
   iv) compilation
   v) methods of proving and refuting.

Inductive and deductive methods

When we observe the scientific process, it is difficult to separate induction – reasoning from experience – and deduction – logical derivation of consequences from the assumptions formulated in the form of universal (general) statements.

In the opinion of certain scientists, induction and deduction have a common basic subject of knowledge, which is accessed by integrating both methods (Primorac, 2010). Therefore, it is difficult to make a sharp distinction between induction and deduction in qualitative research. Thus, in research using inductive methods, the aim of a researcher is to form theoretical concepts on the basis of obtained data and the results. On the other hand, in those studies which are based on deductive methods, the goal of researchers is to test concepts and patterns that are known from the theory using new empirical data. Bearing this in mind, inductive methods are otherwise known as methods for formulating new theories, while deductive methods are seen as methods for testing existing theories. The aim of testing a theory is not only to verify its validity and reliability, but also to offer its possible improvement. Furthermore, it should be taken into account that both methods are of equal importance for the advancement of science.

Unlike traditional empirical studies, qualitative research emphasizes the induction method as a primary method of cognition (Primorac, 2010). The inductive method involves the systematic application of inductive reasoning, wherein one comes to general conclusions based on the analysis of individual facts. Within the inductive approach, a theory is not a starting point in research, but may be developed as a result of research. Therefore, the inductive method is otherwise known as the 'bottom-up' approach, while the deductive method is often informally called the 'top-down' approach.

Another name for valid reasoning is deductive reasoning. Hempel and Oppenheim (1965) were the first to come to the conclusion that all scientific explanations have a common logical structure: they are given with the help of deductive logic.

This method represents the use of a deductive method of reasoning, wherein the unique and specific conclusions are drawn from general judgements. In accordance with the rules of deductive logic, this means the infallible syllogistic

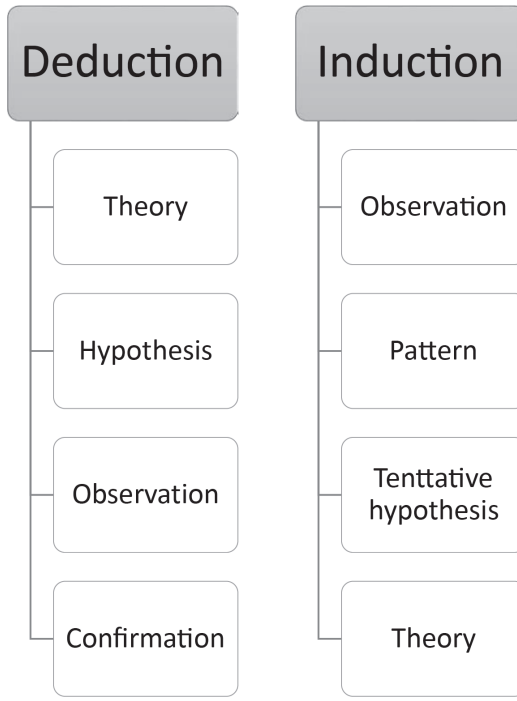

Figure 4.2 Deduction and induction

reasoning as: all A are B, all C are A → all C are B, whereas it really 'cannot' happen that the conclusion is false if the premises are true. The reasoning is, hence, the process in which, by following the rules of thinking, one starts from a group of viewpoints and ends with a new viewpoint. The deductive method deals with testing and confirming hypotheses.

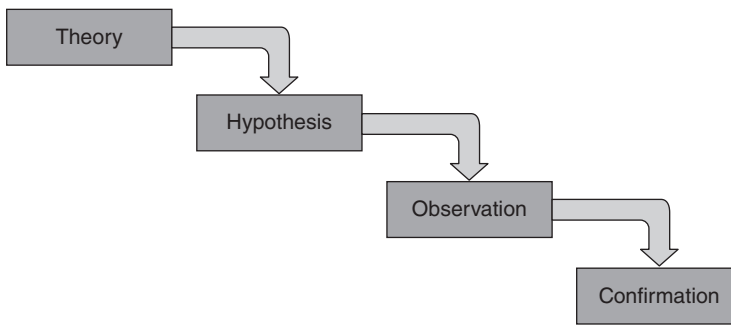

Figure 4.3 The deductive method (source: http://www. socialresearchmethods. net/kb/dedind.php)

The most important elements of the deductive method are the following procedures: analysis, synthesis, generalization, abstraction, proving and compilation.

a) The method of analysis is the process of scientific research in which complex concepts are broken down into their simpler component parts. The general object of analysis is always a complex whole, which cannot have less than two interrelated parts. The whole and its parts have their own spatial and temporal characteristics, their qualitative and quantitative features and properties, composition, external and internal relations and relationships, movements, changes, development, etc. There are two types of analysis: descriptive (when the elements of the whole are described) and explicative (when the whole is explained based on its parts).
b) The method of synthesis is the process of scientific research wherein the understanding of a complex whole is done by placing their individual and specific parts in various possible relations and relationships. Subjects of synthesis may include concepts, attitudes, judgements, conclusions, etc.
c) The method of generalization is the thought process of generalization, which implies that by starting from one particular notion one can reach a more general notion that is at a higher level than any other (Kulenović, 2005). The basic concepts of generalization, which are essential for quantitative research, are now being applied to a certain extent in qualitative research as well. 'The generalization of research results is not established upon the final analysis, but rather by the induction that begins on the individual case' (Primorac, 2010, p. 23).
d) Abstraction is one of the basic methods of scientific knowledge within the system of methods. Its overall process consists of either the extraction of the general and elimination of the particular or the extraction of the particular and neglect of the general. Subjects of abstraction are concepts, attitudes, judgements, and conclusions, etc.
e) Proving is one of the most important scientific methods in which almost all the methods and all the special methodical procedures are incorporated, including: analysis and synthesis, generalization and specialization, induction and deduction, abstraction and concretization, as well as others. The opposite procedure in relation to the process of proving is refuting.
f) The method of compilation is the process of utilizing other people's scientific research results, that is, other people's perceptions, attitudes, conclusions and insights. The comparative method is the comparison process of the same or related phenomena so as to determine the similarities in behaviour and intensity, as well as the differences that exist between them. We should distinguish the total, complete identicalness of all the factors of a whole from the partial identicalness that relates only to certain parts, factors, properties, relationships, changes, etc. We often encounter similar forms whose contents and essence are completely opposite. By applying the comparative method, one can easily discover the specifics, that is, both the advantages and disadvantages of various social phenomena (e.g. modes of production

and distribution). The difference between individual economic systems is reflected in the application of different methods in solving the above-mentioned general and similar problems, and the comparative analysis provides significant assistance in this matter. It is worth noting that in most research in the social sciences both methods (inductive and deductive) are used when drawing conclusions.

Special methods

Special methods include: positivism, historical method (method of understanding) and dialectic method.

Positivism

Positivism is the oldest and the most influential methodological approach. In the literature, we can often find the division of positivism into early positivism, neo-positivism and post-positivism. In the broadest sense, positivism represents the rejection of metaphysics. In other words, the term scientific includes only those phenomena that can be seen and measured. According to the positivist worldview, science should help us understand the world well enough as to be able to perform predictions.

Many of our stereotypes about science originate from the period in which that particular direction of philosophy (i.e. positivism) dominated. However, science has progressed in the era of post-positivism, wherein we have overcome many of these stereotypes. Auguste Comte was the founder of early positivism in the second half of the nineteenth century. The most important social sciences (economics, sociology and history) were formed at the time of positivism. Comte advocated the development of the social sciences modelled upon the natural sciences and for their separation from the religious way of thinking. It is for these reasons that positivism has persisted for such a long time, up until the present day.

As it developed, early positivism evolved into neo-positivism (Lazarsfeld). It adhered to all the principles of positivism in addition to introducing a system of measurement in the social sciences, thus advancing the social sciences towards the ideal of the natural sciences. Positivism indicates that only 'factual' knowledge gained through observation, including measurement, is reliable. In fact, positivism relies upon empiricism (based on the idea that observation and measurement is the core of scientific endeavour). According to this opinion, every notion that cannot be translated into the language of variables is unacceptable for modern social sciences.

This principle was brought into question for the first time in the second half of the last century. In fact, many things have changed our views of science since the mid-twentieth century. One of the most accepted forms of post-positivism in philosophy is known as critical realism. Supporters of this direction of thinking believe that we cannot comprehend our reality with absolute certainty based on observation, and therefore all theories are subject to subsequent correction. Based on the results of our research, we can determine whether our theory corresponds to the obtained results. If it does not correspond well, then we have to revise the

theory so as to predict reality better. Theories that pass all the tests and measurements and persist are often compared with the natural species that have survived throughout evolution. According to the principles of positivism, knowledge is derived from human experience. Crowther and Lancaster (2008) emphasize the adoption of the deductive approach as a general rule in positivism. Positivism is one of the most suitable approaches for studying the nature of the relationships between phenomena. It has found greater application in business studies than in other disciplines. This is because business relations are made from the integration of relationships among individuals within and among companies.

The principles of positivism are:

a) avoiding subjectivity in the research procedure as much as possible;
b) applying the same principles for the development of natural and social sciences;
c) solving practical problems in society;
d) separating 'normal' from 'pathological' social phenomena – everything that 'stands out' from the average is 'pathological'.

Historical method (method of understanding)

'Subjects of study in qualitative research must be considered from a developmental point of view and comprehensively in their historical dimension taking into account that every current situation or problem is the reflection of some past events' (Primorac, 2010, p. 29). Wilhelm Dilthey founded the method of understanding in the nineteenth century. He made a clear distinction between the natural and the social sciences, believing that all social phenomena and processes have their historical component. In other words, many social phenomena can only be studied scientifically when viewed in their historical context.

Methodology based on the dialectics

Dialectics is the qualitative research method. This method is based on the understanding that all phenomena in nature and in human society are in universal mutual connection. The methodology based on dialectics implies, under the scientific method, a dialectical unity of:

a) logical principles and rules;
b) theoretical knowledge of reality; and
c) practical actions and technical resources that are used in research activities.

General scientific methods

The modern way of acquiring scientific knowledge involves the synthesis of quantitative and qualitative analysis. The quantification of the social sciences is not new. It was introduced in the 1920s, when sociology and economics were young sciences. In this way, their quantification was supposed to strengthen the

status of these sciences (McCloskey, 2005). A few decades later, Paul Samuelson (1947) and Kenneth Arrow (1951), in particular, advocated the application of mathematics in economic research.

The genesis of the development and application of mathematical economics, based on logical and other methods, has its roots in the work of the French scientist Cournot (1960). The complementarity of theoretical and empirical research can also be found in the works of Kuznets (1966), Goldsmith (2000), Friedman (1953) and others. In recent times, there are many supporters of the mathematization of economics. For example, Edesess (2012) provides a mathematical approach to some of the key problems facing the economic theory, thus initiating a series of economic debates. The scientist McCloskey (2005) also supported the idea of the mathematization of economics. He believes that the usual objections related to the application of mathematical and statistical methods in economics are unacceptable. In his opinion, the supporters of this view are those scholars who emphasize the superiority of the natural sciences in relation to the social sciences (McCloskey, 2002). Furthermore, the famous French economist Walras once pointed out that 'many economists who do not know mathematics, appear as the biggest critics of its application in solving economic principles' (Walras, 2010). There is also an opinion among economists that it is rather difficult to use mathematics in economics, and hence they advocate that it is better to use some other methods that are not essentially mathematical in nature. However, Edesess (2012) argues that it is not the pervasive use of mathematics in economics that is the source of all the problems and general confusion, but the fact that we should not apply the mathematical model everywhere; that is, the use of the mathematical model is meaningless when something cannot be measured. In his opinion, mathematics is excessively used in economics, and too much of it is considered of poor quality. This mathematical haughtiness is the core of the critical state of economic theory, which was worsened by the financial crisis (Edesess, 2012). In other words, the economy cannot over-rely on accurate mathematical models, considering that we cannot put an equal sign between economics and mathematics.

Box 4.1 The benefits of mathematics in economic analysis

Whether we choose the mathematical or theoretical approach to economic analysis is of little significance, in comparison to the importance of the benefits of mathematics in terms of improving analysis and a higher degree of explicitness on every level of reasoning.

Moreover, mathematical economics should be seen as a special approach to economic analysis, which is fundamentally no different from the non-mathematical. The main distinction between 'mathematical economics' and 'theoretical economics' is reflected in the fact that, within mathematical economics, the assumptions

and conclusions are expressed in mathematical symbols instead of words. In addition, the 'language' used in mathematical economics is characterized by conciseness and greater precision, which is not always the case in theoretical economics (Radović, 1996, p. 154).

Finally, it can be concluded that although the quantification of social and economic phenomena has had more opponents than supporters from the very beginning of its application, mathematical-methodological knowledge has passed the test of time and it has not lost its relevance up to the present day.

Points for discussion

1 Explain the basic function of methodology.
2 Discuss what makes up scientific knowledge.
3 Analyse why it is often impossible to study social problems by using experimental methods.
4 Explain the advantages of an interdisciplinary approach to research in the social sciences.

References

Arrow, K. (1951). *Social Choice and Individual Values*. New York: John Wiley & Sons.

Beckert, J. (2013). Capitalism as a system of expectations: Toward a sociological micro-foundation of political economy. *Politics and Society*, 41(3), 323–350.

Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices* (2nd edition). Florida: Creative Commons Attribution.

Blaug, M. (1980). *The Methodology of Economics: Or How Economists Explain*. Cambridge: Cambridge University Press.

Cournot, Antoine Augustin (1960) [1838]. *Researches into the Mathematical Principles of the Theory of Wealth*. New York: Kelley.

Crowther, D. and Lancaster, G. (2008). *Research Methods: A Concise Introduction to Research in Management and Business Consultancy*. Oxford: Butterworth-Heinemann.

Edesess, M. (2012). An attack on Paul Krugman. *Advisor Perspectives*. Available at: http://www.advisorperspectives.com/newsletters12/20-krugman2.php

Friedman, M. (1953). The methodology of positive economics. In: *The Methodology of Positive Economics*. Chicago: University of Chicago Press, pp. 3–43.

Goldsmith, E. (2000). Is science neutral? *The Ecologist*, 30(3), 20–23.

Hempel, C. G. and Oppenheim, P. (1948). Studies in the logic of explanation. *Philosophy of Science.* Reprinted (with a postscript) in C. G. Hempel, *Aspects of Scientific Explanation.* New York: Free Press, 1965, pp. 245–295.

Ioannides, S. and Nielsen, K. (2007). *Economics and the Social Sciences: Boundaries, Interaction and Integration*. Cheltenham: Edward Elgar Publishing.

Kulenović, Z. (2005). Metodologija istraživackog rada [Scientific Research Methodology], Faculty of Maritime Studies, University of Split.

Kuznets, S. (1966). *Modern Economic Growth*. New Haven, CT: Yale University Press.

McCloskey, D. (2002). *The Secret Sins of Economics*. Chicago: Prickly Paradigm Press.
McCloskey, D. (2005). *History of Economic Ideas*, XIII(3), 85–102.
Martin, R. (2011). The limits of the scientific method in economics and the world. Available at: http://blogs.reuters.com/great-debate/2011/11/11/the-limits-of-the-scientific-method-in-economics-and-the-world/
Ostle, B. and Mensing, R. (1975). *Statistics in Research* (3rd edition). Ames, IA: Iowa State University Press.
Poli, R. (2014). Anticipation: A new thread for the human and social sciences? *Cadmus*, 2(3), 22–49.
Primorac, Z. (2010). Uvod u filozofiju znanosti [Introduction to the Philosophy of Science], University of Mostar.
Radović, M. (1996). Ekonomska analiza na novim (kvantitativnim) osnovama [Economic analysis on new (quantitative basis)]. In: R. Aničić (Ed.) *Uvod u metode ekonomske analize-teorijsko filozofske osnove naučnog metoda* [*Introduction to the Method of Economic Analysis and Theoretical Philosophical Underpinnings of the Scientific Method*]. Faculty of Economics, University of Belgrade.
Robinson, J. (1962). *Economic Philosophy*. London: Watts.
Samuelson, P. A. (1947). *Foundations of Economic Analysis*. Cambridge, MA: Harvard University Press.
Walras, L. (2010). *Elements of Pure Economics*. London: Routledge Library Editions: Economics.