

# Chapter 2

## Origins of Experimental Economics

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**Abstract** This chapter addressed the determinants of the formation and development of experimental economics. Its first part discussed the widely accepted definition of economics proposed by Robbins and its consequences to the methodology of economics. Emphasis was placed on those which referred to the applicability of experiments as a method to expand knowledge on economics. The second part of the chapter presented the short history of experimental economics. When describing the first experiments, the development path of experimental economics was carefully analysed, and emphasis was put on its contribution to the theories of both micro- and macroeconomics. The chapter is concluded with a brief summary pointing to the relevance of experimental economics.

**Keywords** Experimental economic theory • Methodological background

### 2.1 Introduction

Experiments as a research method and a separate method of empirical study of the real world have been at the foundation of acquiring knowledge in many disciplines of science for more than four centuries. In this context, the tradition of using the experimental research method in economics<sup>1</sup> is relatively new since “the proper construction of a counterfactual control group was not given foundations until the early twentieth century” (List and Rasul 2011).

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<sup>1</sup> An interesting approach to presenting the history of experimental economics was proposed by Roth (1993), Guala (2008a, b) and Svorenčík (2015).

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Experimental economics derives from both traditional economics and criticism of its assumptions, so when describing the process of formation of experimental economics, one should begin with a brief presentation of economics and its paradigm. The purpose of this chapter is to present determinants of the formation of experimental economics and its short history.

### ***2.1.1 Determinants of the Formation of Experimental Economics***

In broad terms, economics may be defined as one of the social sciences which explains how the real world works, its phenomena and economic categories. Among the plethora of definitions of economics, one is particularly noteworthy in its perception of individuals as the subjects and objects of study of this science. This definition, “analytical”<sup>2</sup> in its nature, was formulated by Robbins, who in his essay of 1932 wrote, “Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses” (Robbins 1932).

This simple, one-sentence definition not only emphasised the relevance of scarcity of resources (means) and effects of shortages, which in those times were at the centre of interest of economics and affected understanding of economic laws and their origins. It also stressed the necessity and purposefulness of choice-making which entailed incurring related opportunity costs. At the same time, this definition pointed to two elements determining the essence of making a choice—alternative character of ends and means (resources). It enabled the normative economics, which had so far been results oriented,<sup>3</sup> to indicate within economic policy alternative ways of affecting economic processes at various stages of the choice-making process.

What is most important from the viewpoint of this study, however, is that in his definition Robbins emphasised the necessity to consider human behaviour as the common foundation for all economic considerations. And although this approach is nothing new in modern definitions of economics, it should be pointed out that Robbins made thus a reference to early views of A. Smith who considered human beings as the main subject of study whose choices were determined by moral and psychological factors. Nonetheless, with the development of economics, Smith’s concept of economic man affected by moral sentiments was abandoned in favour of

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<sup>2</sup> This definition described economics by indicating a method of analysis rather than pointing to the subject scope. The second method addressed by Backhouse and Medema (2009) was defined by the authors as “classificatory”.

<sup>3</sup> It resulted mostly from the former perception of the subject and method of political economics developed by Mill (1966), which in its a priori approach reduced human beings solely to those aspects of their activities which were related to accumulating wealth.

the focus on an individual's benefit as a motive of his or her actions, which—paired with rationality—formed a solid foundation for the development of economics as a science. Nevertheless, it was not the concept of *homo oeconomicus* alone, one of the major paradigms of economics, but also the way of interpreting human behaviour predominant in economic research that became a foundation for methodological discussions and led to a split of this science into orthodox and heterodox economics.

Robbins also made a significant contribution to this. His redefinition of the subject of economics, paradoxically, did not affect the views on the ways of studying human behaviour used in his times. In his essay, Robbins argued that since in reality economic phenomena were very complex and determined by a variety of factors which could not be isolated and measured, observations and experiments could not be treated as a source of economic knowledge (Robbins 1932, 74–79). He also claimed that the basic theses of economic theory should be deduced from the assumption that individuals acted in a rational way in accordance with their consistent preferences<sup>4</sup>, and this indisputable fact based on experience did not need to be validated in controlled experiments (Sugden 2009). It follows, therefore, that when explaining how people make choices in reality, there is no need for economic research to refer to results of psychological tests.

Robbins's methodological approach placed him among economists who consider economics as a formal discipline (a priori science based on deduction), where it is deduction that serves as a method to acquire new knowledge and contribute to scientific development rather than induction and experiments which are attributed to natural sciences (empirical sciences based on induction).<sup>5</sup> In the second, extended version of his essay of 1952, Robbins put even more stress on these issues, indicating that propositions of economic theories, similarly to all “pure” scientific theories, should be deduced from a variety of assumptions. According to Hands (2009), who interpreted Robbins's approach, “economics does not study a ‘kind’ of behaviour but rather studies a particular ‘aspect’ of almost all human behaviour” (Hands 2009). It follows that the type of ends is irrelevant. They are taken as given. “The ends may be noble or they may be base. They may be ‘material’ or ‘immaterial’ - if ends can be so described” (Robbins 1932, 24, 25). In both editions of his essay, Robbins emphasised that knowledge on individual agents is not derived from objective scientific observations from controlled experiments available in sciences but is rather of intuitive, experimental and intersubjective nature.

The above definition of economics was introduced in the time when economics remained under a strong influence of Marshall's economics and the US economy

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<sup>4</sup> It has become the foundation for standardisation of rationality of actions as the following axioms: completeness (order), reflexivity, transitivity and monotonicity of preferences (Varian 1997, 66–78). These axioms allowed formalisation of economic considerations and have become a foundation for constructing consistent logical models of economic reality, disregarding, however, the real motives behind choices.

<sup>5</sup> This distinction between the two paths to scientific advancement was first made in the seventeenth century by Descartes and Bacon and has been used ever since.

was dominated by institutionalism which derived from empiricism an emphasis on the social and historical aspects determining the course of economic processes. The two trends offered different approaches to understanding and development of economic science. The first one focused on methodological individualism, axiomatisation of rational human behaviours and a normative approach to exploring human behaviour (neoclassical economics and other schools and approaches based on the neoclassical paradigm referred to as orthodox economics). The second trend, which dates back to Smith, was guided by methodological holism and a positive approach to research (Veblen and post-Veblen institutional economics and more contemporary economics of complexity, behavioural economics and experimental economics).

In the time when Robbins proposed his definition, it was met with radical comments approving or criticising both his approach to the role of economics as a science and methodological conclusions drawn from it; it was something entirely different from the contemporary “classificatory” approach. It was the subject matter of most vivid discussions during development of neoclassical economics when marginal analysis was first introduced and “economists began to see themselves as modellers” as a result (Backhouse and Medema 2009). They formulated their models, however, based on unrealistic assumptions.

According to Lypsey (Lypsey 2009), long after Robbins had published his essay, economics was seen as he saw it—as a science on the real world (and choices made in this world) and yet based on intuitively obvious assumptions. Robbins was regarded by many economists as a defender of economics against empiricism (the actual one as opposed to the “armchair empiricism”, “common sense empiricism”) (Backhouse and Medema 2009). This best-known definition of economics nowadays was not immediately accepted by economists, and it was not until 1960 that it gained broader, although not universal, approval<sup>6</sup> and the economists began to employ their methods to explain problems traditionally considered to be noneconomic (Backhouse and Medema 2009).

The methodological individualism approach presented by Robbins in his essay, characteristic of neoclassical economics and completed by methodological instrumentalism and emphasis on behaviour analysis under equilibrium conditions, was adopted by all approaches within mainstream economics.<sup>7</sup> Nonetheless, neither economic theories arrived at by deduction nor an impressive and technically sophisticated array of models developed and derived from them did meet the predictive function attributed to each science. This isolation of axiomatic foundations of theories and models from reality led to disregarding other noneconomic

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<sup>6</sup> Robbinsian definition of economics underlying the formalisation of the theory of economics contributed to the so-called economic imperialism which “is the claim of some economists that the methodology of neoclassical economics has superior scientific qualities and should be adopted by most or all social sciences” (Rothschild 2008). This term was first used by Ralph William Souter in 1933 in response to L. Robbins’s essay.

<sup>7</sup> They were named “meta-axioms” and have become a foundation for all the approaches within mainstream economics (Arnsperger and Varoufakis 2008, 19).

factors which did not fit with the concept of rational behaviour of extremely calculating individuals. According to Fine and Milonakis (Milonakis and Fine 2009), mainstream economics focusing on explaining only one type of human behaviour (rational, driven by economic motives) suffered from desocialisation and dehistoricisation.<sup>8</sup> It was met with opposition from many economists promoting a more holistic approach to analysing human behaviour.

According to Hands (2009), Robbins's essay "...is one of the most influential methodological works in twentieth century economics". On the one hand, Robbins's definition implied returning to placing the individual in the centre of the theory of economics. On the other hand, however, the views on subject-related and methodological assumptions, particularly the potential for using experiments, were a reference to Mill, who distinguished social (moral) sciences emphasising that "it is seldom in our power to make experiments in them" (Mill 1836, 146–147). According to Milonakis and Fine (2009), Mill emphasised that, granted that the experimental (a posteriori) method is not available in political economy, the latter has to recourse to deductive (a priori) method. Mill identified also several practical obstacles to using conclusive experiments in economics (Guala 2008a). It was in accordance with the findings of Marshall who contributed to popularisation of mathematics in economics and explained that the dynamics of variables makes it impossible to conduct empirical tests as it is impossible to create experimentally an environment where certain factors are stabilised and the whole system is investigated only in relation to one variable. As a result, the experimental method was found to be impractical, ineffective and—as such—irrelevant in economics. According to Guala (2008b), this approach was commonly accepted till at least the 1980s.

### ***2.1.2 Birth and Development of Experimental Economics***

Despite a short history, precise identification of the turning point widely recognised as the beginning of using experiments in economics and the date when experimental economics was born seems to be impossible.

Some researchers believe that the first isolated experiment of economic relevance and underlying one of the directions of experimental economics dealing with behavioural aspects of decision-making was a lottery game which inspired the formulation of the so-called St. Petersburg paradox in 1738. It was Nicolas and Daniel Bernoulli who contributed to the decision theory through conducting the experiment on themselves. The experiment (a game of chance) involved tossing a coin.

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<sup>8</sup> The authors, when revising the evolution of the theories of economics from the times of Ricardo and Smith to contemporary writings, reveal the reasons behind "desocialisation" and "dehistoricisation" of this science (Milonakis and Fine 2009). For more on this topic, see also (Jackson 2013).

The researchers proved that individuals not always made choices which maximised their gains, and they showed the relevance of subjectivism in the evaluation of the same events by different individuals (Zaleśkiewicz 2011, 99). It also laid foundation for formulation of the utility theory and the hypothesis concerning the shape of the utility function and related approach to risk (Kroll and Vogt 2009). This relevance of the St. Petersburg paradox to the development of experimental economics is emphasised by Neugebauer (2010) who shows that it has inspired academics to validate it in various areas of economics for nearly three centuries.

The discussion on the St. Petersburg paradox attracted also von Neumann and Morgenstern, authors of the theory of games and the book *Theory of Games and Economic Behavior* (1944)—fundamental to the development of experimental economics. The problem of rationality of choices presented in this book in the context of the theory of games was based on a set of neoclassical axioms concerning behaviours of an economic man striving to maximise expected utility. This publication is widely recognised as extremely relevant not only to the origins of experimental economics but also to its further changes and to developments in the theory of games and the decision theory. Guala (2008b) argues that it resulted from the fact that the theory of games not only had a significant contribution to the theory of economics but had also been used by many researchers developing various research approaches and methods “to solve scientific, policy, and management problems across the disciplinary boundaries—from conflict resolution in international relations, to group psychology, cybernetics, and the organization of the firm, to name just a few”.

Based on the results of numerous experiments conducted using the theory of games, researchers frequently formulated rules later incorporated into the theory of expected utility. The aim of those experiments was to show the reality of decision-making by individuals, i.e. investigate individual preferences and choices. The results usually pointed to a number of inconsistencies in the behaviours of players with the theoretical patterns of optimal behaviour. They also became the foundation for formulating examples which did not validate the postulates of the expected utility hypothesis (e.g. Allais paradox or Ellsberg paradox) nor alternative decision theories. The development of the theory of games resulted also in formulation of so-called business games which have become a significant part of experimental education.

Experimental research was also preceded by the formulation of the prospect theory by Kahneman and Tversky (1979). Their theory explains decision-making under risk, and it questions rationality standards adopted by neoclassical economics and hence also the expected utility hypothesis (Giza 2014). The formulation of the prospect theory laid foundation for development of behavioural finance and won Kahneman a Nobel Memorial Prize in Economic Sciences. He received the prize for integration of findings from psychological studies with economic sciences, particularly those referring to human judgement and decision-making under risk (The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2002).

The first typical economic experiment which defined the second path to the development of experimental economics is attributed to Edward Chamberlin. While observing imperfections of the market in the process of adaptation to shocks during the Great Depression, he did not stop at publishing in 1933 his *The Theory of Monopolistic Competition*. In order to validate certain theoretical assumptions made in the study, he carried out an experiment among his students (Holt 1993). It involved introducing a certain structure to the market through grouping students taking part in the experiment into buyers and sellers. Providing buyers with private information (written on pieces of paper distributed to students) on the price of placing an order for a good and sellers with information on the costs of its production, he determined the maximum purchase price and the minimum sale price for transactions made by the students. Since the number of transactions was usually above the number defining market equilibrium, the experiment seemed to suggest the invalidity of the neoclassical theory of market equilibrium and proved the existence of imperfectly competitive markets. Chamberlin's experiment is regarded as one of the first experiments testing economic theories.<sup>9</sup> The literature of the subject perceives it as extremely relevant as it opened the door to the importance of induced values and market institutions in experimental economics (Friedman and Cassar 2004). It also contributed to the origin of experimental research in the field of industrial organisation (Holt 1993).

At the beginning of the 1960s, based on the experiment conducted by Chamberlin, Vernon Smith carried out a number of market experiments, introducing to them public information about rates and offers. Buyers and sellers were able to make offers at the same time (the so-called double auction) and were learning throughout the repeated sessions of the experiment (Smith 1962). The results he obtained seemed to prove the validity of the neoclassical theory of prices (Schmidt 2009), and—fascinated by the results—he initiated a long-term revolution, introducing experimental methods to the mainstream economics (Kopaczewski 2013, 113). Next experiments by Smith concerned the operation of other market forms than perfect competition. They also served the purpose of testing various market institutions and regulations. His introduction of “double auction” to market experiments became a model solution used by many later experimental economists (Landreth and Colander 2012).

In one of his publications (1989), Smith admitted to having conducted his first experiment in January 1956. He pointed out, however, that he was neither the first nor the only researcher to have done it, as there had been others conducting experiments at the same time or even earlier. He named several researchers from the United States and Germany whom he considered to be pioneers of experimental economics; they worked independently and almost simultaneously and yet were unaware of each other's work. Next to Chamberlin (Harvard), he also recognised

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<sup>9</sup> According to Schmidt, however, the experiment was used by Chamberlin as an educational tool revealing imperfections of the neoclassical theory of prices rather than as a strict method to validate the theory (Schmidt 2009).

Hoggatt (Berkeley), Sauermann and Selton (Germany), Shubik (Yale), Siegle and Fouraker (Pennsylvania State) and Friedman (Yale).

Market experiments initiated by Chamberlin and continued by Smith and other experimental economists served testing new instruments of market regulation and contributed significantly, first and foremost, to the development of the microeconomic theory. Smith's achievements were widely recognised, and in 2002 he and Kahneman were awarded a Nobel Memorial Prize in Economic Sciences for employment of laboratory experiments as tools of empirical economic analysis, particularly to investigate alternative market mechanisms (The Sveriges... 2002). V. Smith's contribution to experimental economics is even more substantial. He also contributed to studies on the mechanism of delivery of public goods and promotion of computer technologies—at that time in the phase of development—thus increasing effectiveness of economic experiments, and indicated seven major reasons for using experiments in economics (discussed in detail in Chap. 3) (Smith 1989). It is widely believed that the Nobel Memorial Prize awarded in 2002 established the position of experimental economics and the role of experiments in economic research. Nevertheless, the two Nobelists of 2002 “have different approaches to modelling economic behaviours: Kahneman focuses on the analysis of individual behaviours whereas Smith pays more attention to the aspects of interactions between individuals, establishment of social institutions and collective thinking” (Kopaczewski 2013).

Macroeconomics turned out to be the last bastion of economics resistant to the influence of new tendencies in the use of the experimental method to economic research. Laboratory experiments were not recognised as an appropriate method to validate macroeconomic theories since it was impossible to control the economy so as to analyse the effects of alternative institutions and policies. As recently as the late 1990s, opinions were popular that the experimental method could not be successfully applied to macroeconomics on a large scale. According to Sims (1996), “Economists can do very little experimentation to produce crucial data. This is particularly true of macroeconomics”. And in his famous textbook on macroeconomics published one year later, Blanchard (1997) indicated even that “macroeconomists, who want to find out, for example, how changes in the money supply affect aggregate activity cannot perform such controlled experiments; they cannot make the world stop while they ask the central bank to change the money supply”.

It turns out, however, that macroeconomists use the laboratory method to investigate problems which have been so far described by theories and complex formal economic models which are validated empirically through observation of real economies. As a consequence, contemporary economic theory separates experimental macroeconomics as a relatively new discipline which “is aimed to use controlled laboratory method to test predictions and assumptions of macroeconomic models and to analyse aggregate economic phenomena” (Chytilova 2013).

According to Duffy (2008), precise origins of macroeconomic experiments are rather not clear, yet he is inclined to believe that they can be traced back to “Lucas's 1986 invitation to macroeconomists to conduct laboratory experiments to resolve



macro coordination problems that were unresolved by theory”. Chytilova (2014), on the other hand, argues that development of experimental macroeconomics would not have been possible without prior “rational expectation revolution” initiated by Lucas. She also emphasises that “experimental macroeconomics shouldn’t be omitted as one of the possible methods in economics, since individual and aggregate outcomes might be assessed”.

Expectations play a crucial role in macroeconomics, monetary economics, fiscal policy and finance, and as a result the last decade witnessed a significant increase in the number of laboratory experiments performed to study individual expectation formation, the interactions of individual forecasting rules and the aggregate macro-behaviour they cocreate.<sup>10</sup> In the last two decades, economic experiments were used, in turn, to analyse such major macroeconomic problems as strategic behaviour, coordination issues, optimal lifetime consumption and savings decisions, theories of money, commitment versus discretion and fiscal and tax policies. The experimental method is well suited for studying the implications of different public policies and for inferring unobservable behaviour such as expectations formation (Amano et al. 2014). Selected macroeconomic experiments are presented in Chap. 5.

## 2.2 Summary

In a relatively short period following Robbins’s publication of his essay, set against the effects of the Great Depression and—later—World War II, economics experienced a Keynesian revolution (when writing about “animal spirits”, its initiator emphasised the relevance of psychological factors to market behaviours) and an increased significance of the econometric movement (relying on a large number of observations and statistical material derived in this way) and the rapid development of heterodox economics.

Although the mainstream economists strongly defended their research<sup>11</sup> method, the development of unorthodox economics gradually contributed to extending the scope of economic research and eventually also to using experiments to acquire new knowledge in economics, transforming this discipline into one where major advancements and breakthroughs are based on the data gathered from experiments. Guala (2008a, b) found it to be one of “the most stunning methodological revolutions in the history of economics” and considered experimental economics as the protagonist in this revolution.

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<sup>10</sup> A more recent review of the literature on this topic and description of certain results of such experiments is offered by Assenza et al. (2014).

<sup>11</sup> Wojtyna believes it resulted from considering certain unorthodox concepts as part of mainstream economics (Wojtyna 2009).

Despite its short history, experimental economics contributed to a fast development of the economic theory, particularly within its behavioural foundations and microfoundations of macroeconomic considerations. At present, experimental economics is considered as one of heterodox approaches to economic research originating in the erosion of traditional economics and forming one school of behavioural economics (Tomer 2007). It is also believed that experimental economics will not formulate its separate paradigm nor will it oust the mainstream economics, yet its results cannot be underestimated (Noga and Noga 2014). It has already given origin to other concepts which are considered part of the mainstream economics (Wojtyna 2009), and the experimental method may become a standard tool for economists.

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