# Preface

Almost eighty years ago the British economist Lord Robbins proposed what is now his famous and universally accepted definition of economics in his classic book *Nature and Significance of Economic Science*[1]:

> "Economics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses".

Robbins' definition was not, however, readily accepted at first and raised many controversies. In fact, several epistemological issues underlying this definition have been discussed since its conception. Backhouse and Medema[2] offer a recent and lucid discussion about the controversies, as well as the slow acceptation of Robbins' definition.

Two main issues derive from this definition. The first is that scarcity is the primitive concept underlying any type of economic problem. The second is that, to some extent as a consequence of the scarcity issue, economics aims to deal with scarcity in the best possible way. Technically speaking, economics attempts to "optimize" the existing scarcity. In short, as Intriligator[3] states, "economic problems" can be expressed as particular cases of "mathematical optimization problems". The underlying optimization problem can be undertaken within an environment devoid of institutions (a "Robinson Crusoe economy") or within an environment with very dense institutions (the "current global economy"). But at the two opposite poles or in any intermediate state, the "economic act" is analytically speaking "an optimization act".

According to the above ideas, it is reasonable to accept that economics strongly depends on the state-of-the-art of current mathematical optimization theory. In this

[1]Robbins LC (1932) An essay on the nature and significance of economic science. Macmillan, London.

[2]Backhouse RE, Medema SG (2009) Defining economics: the long road to acceptance of the Robbins definition. Economica 76: 805–820.

[3]Intriligator MD (1971) Mathematical optimisation and economic theory. Prentice-Hall, Englewood Cliffs, New Jersey.

sense, we should stress that economics is today generally underpinned by a classic optimization theory. This type of theory postulates the optimization (maximization or minimization) of an objective function that is assumed to represent the preferences of the economic agents (e.g., utility for a consumer, profits for a producer, etc). On the other hand, the optimization process is subject to a set of constraints being met. This can be understood as a representation of the economics side of scarcity (i.e. budget restraint, technology of a production process, etc).

Given this close connection between economics and optimization theory, it is worthwhile investigating what effects a change in the underlying mathematical optimization paradigm might have on economic science. Such a shift in the optimization paradigm has occurred in the last 40 years or so, with the slowly evolving of the Multiple Criteria Decision Making (MCDM) paradigm. The main purpose of this book is to analyse some potential effects of this shift of paradigm on an important branch of the economic analysis: the design and assessment of public policies. We will show throughout the book how this branch of economics can be considerably revitalized by formulating and solving the basic problems of this discipline within the MCDM paradigm. Thus, the acceptation of this new paradigm as a framework for economic policy implies new challenges, but also more realistic formulations, as well as more pragmatic solutions to the design of public policies especially when environmental and traditional economic criteria are considered together.

The MCDM paradigm has been developed mainly within the field of operational research/management science (OR/MS). Although it has been used to address many economic problems, it has not been fully incorporated yet into the core of economic thinking, and it remains unknown to many economists. Therefore, we would like to stress that our effort could be useful for re-building bridges between economics and operational research/management science (OR/MS). This connection takes place, first, through the extensive application of MCDM to a classical economic problem, such as the design and evaluation of economic policies. And second, our work establishes another connection between OR/MS and economics in the sense that we address policy design problems by combining MCDM techniques with structural economic models.

From the economics side, we need some analytical representation of the main economic mechanisms, such as production and consumption decisions, as well as markets for goods and inputs, to properly specify our policy design problems. Computable general equilibrium (CGE) models are useful for this representation of the economy. Such structures have been used extensively since the 1980s in the evaluation of public policies and other simulation exercises in both developed and developing countries. CGE modelling is especially attractive for policy-makers since, being consistent with standard economic theory, it can measure the effects of a specific change (e.g., a given policy) on the most significant economic variables such as prices, production levels, tax revenues, and income distribution.

The importance of the connection between economics and OR/MS was quite clear in the 1950s and 1960s, with important contributions by leading figures in economics like Arrow, Baumol, Dorfman, Hicks, Leontief, Samuelson, Solow,

among others. However, this important tradition of linking economic problems with OR/MS almost vanished as of the early 1980s, which, in our view, is an important loss to both disciplines. We insist that our book can help to fill this gap. Thus, it is intended for postgraduate students and researchers of economic policy with an OR/MS orientation or of OR/MS with an economic policy orientation. In short, economic policy can be revitalized with new formulations and analytical procedures borrowed from the MCDM paradigm, whereas OR/MS can also be stimulated with the appearance of new interesting areas of application.

We are aware of the limits of our analysis. In fact, we only present initial and tentative procedures and solutions, but hopefully in a new and promising direction.

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