

Review of Bernard Walliser's *Comment raisonnent les économistes: les fonctions des modèles*. Paris: Odile Jacob, 2011, 278 pp.

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Bernard Walliser is an economist at Paris-Jourdan Sciences Économiques (PSE) whose main research interests are in game theory (epistemic and evolutionary) and the methodology of economic models. His book provides a broad overview of what scientists in general, and economists in particular, do with their models. The French language literature on models is at best sparse, and this book contributes to filling the linguistic blank. But beyond this value for French readers, the project is itself original and of interest to a broader audience. Walliser's systematic typology of the different functions of models improves our understanding of them by putting them into a comprehensive epistemological framework.¹ The first part of this review will describe this typology in more detail, before turning to some critical comments.

The core of the book consists of six chapters, each one focussing on a distinct function of economic models. 'Function' here is to be loosely understood as the purpose a model can fulfil. The functions identified by Walliser (and whose labels will be explained below) are: 1) iconic, 2) syllogistic, 3) empirical, 4) heuristic, 5) praxeological and 6) rhetorical. This typology is explained in the introductory chapter.

Walliser claims that every model can be studied using both internal and external points of view. From the external point of view, a model is seen as referring to a target system, which can be real or not, and linked to it by bridge principles, i.e., rules that connect theoretical statements to observational statements. The internal point of view conceives the model as a system in itself that can be used for various conceptual operations, like simulation.

¹ It should be noted that the book is an extension of previously published papers (e.g., Walliser 2007a; 2007b) that already developed the main ideas behind the typology. English-speaking readers interested in the typology's basic framework may turn to Walliser 2007b, albeit at the loss of the explanatory depth, examples and conceptual analysis found in the book.

In addition, Walliser claims that each model can be analysed along three dimensions: the syntactic, semantic, and pragmatic. The syntactic dimension concerns the model’s form, the semantic its content and the pragmatic its use. By combining these—applying the two points of view on each dimension—we get Walliser’s typology of the six functions fulfilled by every model. Walliser identifies each function with a central epistemological problem and an associated virtue. Figure 1 summarizes the typology in a table.

Figure 1: Walliser’s typology of models summarised

DIMENSIONS	EXTERNAL	INTERNAL
SYNTACTIC	<p>Iconic Problem: <i>Interpretation</i> Virtue: <i>Expressivity</i></p>	<p>Syllogistic Problem: <i>Explanation</i> Virtue: <i>Tractability</i></p>
SEMANTIC	<p>Empirical Problem: <i>Idealization</i> Virtue: <i>Plausibility</i></p>	<p>Heuristic Problem: <i>Cumulativeness</i> Virtue: <i>Fecundity</i></p>
PRAGMATIC	<p>Praxeological Problem: <i>Instrumentality</i> Virtue: <i>Operationality</i></p>	<p>Rhetorical Problem: <i>Performativity</i> Virtue: <i>Intelligibility</i></p>

The *iconic* function may be summarized as “to know is to represent” (p. 15).² Here, models are used to formally represent systems of which we only have an intuitive grasp. Bridge principles link the model to its system of reference. The central epistemological problem here is therefore *interpretation*: assigning meaning to the model’s variables and their relationships with the target system. The characteristic virtue for the iconic function is the model’s *expressivity*: its capacity to express the relevant and essential properties of the target system.

The *syllogistic* function may be summarized as “to know is to calculate” (p. 57). Models are here used to derive conclusions deductively from a set of hypotheses. They are instruments of reasoning that allow us to draw and structure inferences. The central epistemological problem, explanation, concerns the nature of the processes from which a model’s conclusions are derived. Its characteristic virtue is *tractability*.

² All quotes are freely translated from French by the reviewer.

The *empirical* function may be summarized as “to know is to test” (p. 99). It concerns the relation between the model and the empirical world. A model is always at some distance from reality, a distance that has to be evaluated. The central epistemological problem here concerns *idealization*. The characteristic virtue of a model here is *plausibility*—i.e., its ability to convincingly represent the target system.

The *heuristic* function may be summarized as “to know is to create” (p. 141). New models tend to borrow from previous models. The central epistemological problem here is *cumulativeness*, which concerns how models cohere with each other and what continuity the knowledge they bear has through time. A model will be *fecund*, the function’s characteristic virtue, if it can serve as the basis for other, related models.

The *praxeological* function may be summarized as “to know is to intervene” (p. 183). Models are used to investigate certain practical questions by predicting what the consequences of a given intervention would be. The central epistemological problem here is of *instrumentality*. Models must here have the characteristic virtue of *operationality*, the capacity to be used to answer questions about possible interventions.

The *rhetorical* function may be summarized as “to know is to communicate” (p. 225). Models are used here as a communication device to allow modellers to share their thoughts and results explicitly and pedagogically, to express various ideas that can be grasped by an audience. The central epistemological problem here is *performativity*. Models influence the beliefs and cognitive representations of agents, be they individual or collective, by suggesting that they should be structured according to what the model claims. The characteristic virtue of a model here is *intelligibility*.

Walliser expresses some criticisms—especially in the conclusion—about the current state of economic modelling, but these criticisms do not follow directly from his typology. The typology rather serves as a tool of investigation by pointing out how things *can* go wrong. Walliser says that,

models exhibit an over-obligingness that makes them lose a lot of their rigor and relevance. Modelling has become an exercise apparently too readily within the reach of any newcomer in the profession. It amounts to the translation into a formal language of

preconceived ideas, of imported conceptions or of trivial regularities (p. 271).

However, Walliser does not advocate a return to a more 'literary' economics. He suggests different ways by which we can resist the alleged trivialization of economic models. Greater attention should be paid to their interpretation, their empirical validation, and their vulgarization. They should also be subject to stricter norms of acceptance and selection. He is hopeful about recent empirical developments in experimental and behavioural economics, and the tighter links economics now has with other social sciences.

The book offers an interesting typology for people interested in models in general. Walliser's systematic approach also makes it easy to locate and understand the different issues he addresses. He also gives numerous examples, though mostly from economics, to illustrate his points. The structure of the book forces the reader to reflect on the relations between the different functions of models and specific epistemological problems.

An interesting feature is that each chapter finishes with a quick overview of how that function is instantiated, with some variation, in the formal, natural, and social sciences. This discussion, even though it only scratches the surface, is certainly welcome and should be carried further. Models are often studied either in a very abstract manner or in the context of their application within a specific discipline. Walliser avoids either extreme, in line with his intention that the typology serve as a general epistemological framework for thinking about models.

Walliser's book is primarily theoretical. That is, he describes the functions of models *qua* models, but he does not aim at assessing whether or not particular economic models attempt or successfully fulfil them. When expounding the different functions he does not merely present hypothetical suggestions, but rather claims categorically that models are this and that, and that modellers are motivated by very specific reasons. However, at least some of Walliser's positions are considered very differently in the literature.

For example, Walliser retains the deductive-nomological (D-N) model of explanation (Hempel and Oppenheim 1948) as the right account of explanation (p. 73). He claims that both causal and intentional types of explanation in economics obey the D-N model (pp. 77-78). While it is certainly true that these explanations *can* often be construed in terms of the D-N model, it is widely accepted today that the D-N model of

explanation is deficient in general and especially for economics (Hausman 2009). The reader should be aware that there are potential controversies around some of Walliser's claims.

Despite the mainly descriptive character of the book, it is sometimes not clear whether some of Walliser's claims are meant to be taken as matters of fact or rather as appraisals of modelling practice—e.g., “a model is *over-cumulative* if it is tirelessly repeated without any real novelty” (p. 171, emphasis in the original). This is especially the case when he discusses the problems associated with the different functions. He claims that models can be *over* or *under* affected by them, but this is contentious. For instance, there is no accepted understanding of what it would mean for a model to be ‘over-explanatory’ or ‘under-explanatory’. Some recent accounts of models even deny that they can be explanatory at all (see Reiss 2012). Whether or not economic models do, or even can, suffer from the problems Walliser identifies is not a settled matter but rather the object of on-going discussions. The fact that a model is “tirelessly repeated”, for instance, could be a virtue if the model is empirically adequate, as is arguably the case with some models in the natural sciences.

Like any good typology, Walliser's helps us to think clearly and systematically about its object. One can probe a model using the typology's categories in order to evaluate how it fares with respect to the qualities and problems models can have. One can use it to see the similarities and differences between various models, as Walliser often illustrates. However, it is sometimes difficult to understand to what extent these functions (and the problems they are associated with) are really independent. For instance, Walliser identifies the problem of explanation as pertaining to the syllogistic function. However, whether or not a model aims at (iconic function) and succeeds in (empirical function) truthfully representing the relevant causal relations is considered central to the ‘paradox of explanation’ (Reiss 2012).

To causally explain, a model has to receive a realist interpretation and it must accurately represent the causal relations at work. Conversely, the problem of idealization that Walliser discusses in connection to the empirical function is generally conceived as being central to how we should interpret (iconic function) economic models (Mäki 2009). Indeed, the discussion about idealization has generated an important literature on the fictional status of scientific models (Suárez 2009). This raises questions about the general accuracy of the

typology, at least with respect to how these issues are usually treated in the literature.

A discussion on the relations between the different functions would probably have helped to clarify these issues. It would have been especially interesting concerning the qualities linked to each function, since these raise important questions. For example, are there trade-offs between the different qualities, for instance between expressivity and fecundity? Game theory would on this account be considered quite fecund, but at the cost of expressivity, since interpreting it poses serious problems (see Grüne-Yanoff and Lehtinen 2012). Or, to what extent is a model's operationality helped by its tractability? A macroeconomic model that cannot give clear answers about the consequences of potential interventions would have limited usefulness for the policy-maker. Although Walliser does not address such questions, his book suggests them as a possible line of inquiry for future research on the functions of models.

A final critical point is that it is very difficult to relate this book to the current literature on the subjects it covers. The book contains almost no in-text references, and one finds at the end of the book only a reduced "Summary Bibliography" of less than a page. The reader is at a loss to understand why these twenty entries in the bibliography were selected, while many other papers and books that are part of the literature were left out (for a good overview of the literature involved see Hausman 2008; Frigg and Hartmann 2012; Knuuttila and Morgan 2012).

The philosophical discussion on economic models comprises many different positions and arguments with very little consensus, and it would have been interesting to understand where Walliser locates himself with respect to that ongoing conversation. When he does take a position on a contested issue, its context is never mentioned, and we do not learn who defends opposite views and what their objections to Walliser's claims might be. As a corollary, it is difficult to recognise when Walliser is advancing an original and perhaps controversial opinion of his own, and when he is merely relating a generally accepted understanding of models. This shortcoming makes the book less useful for students who wish to introduce themselves to the subject.

All in all, Walliser's book is best suited for people who already have some knowledge about the philosophical issues related to economic models, but want to better grasp the many functions models have.

Apart from the more than welcome addition to the French literature, Walliser's main and substantial contribution is a systematic and original typology that brings the various functions models can have under a single epistemological framework.

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