Xavier de Donato Rodríguez

Ideal Types and The Making of Parallel Worlds

ABSTRACT. A certain tradition in the philosophy of economics has understood economic models as fictions intended to be more as ideal constructions than genuine representations of real economic mechanisms. Against the idea, defended by Cartwright, Mäki, and others, that economic models are abstractions from reality that try to isolate the causally relevant factors of real economic processes, other philosophers aim to stress that what economic models do is in fact create "parallel worlds" from which we can learn something about real economic systems (cf. Sugden). In this sense, *homo oeconomicus*, the capitalist system of production, or the neoclassical firm, are just "ideal types" that allow us to provide some understanding of what happens in the real economy. The present contribution aims at clarifying the role of idealization and abstraction in economic modelling by providing an analysis of how this task can be carried out. I begin by providing an explication of Max Weber's ideal types as *abstract objects*. I suggest (but do not develop) that they are better to be conceived as abstract objects that are parallel correlates of real systems only to a highly ideal extent and must primarily provide counterfactual explanations of what is going on in real economic processes.

KEY WORDS: economic models, idealization, ideal types, fictions, abstract objects

1. Introduction

Today it is commonly admitted that idealization is a usual and important resource not only in natural sciences' methodology, but also in social sciences like economics. It is in fact a *locus communis* that economic models are indeed the product of idealizations or that they are highly idealized. It is nevertheless far from being the case that philosophers have reached a real consensus on how to understand this idealization process. Quite to the contrary, there are different, often opposed, ways of how to characterize idealization and its role in scientific modelling. Even worse, there are

very few formal (or semiformal) approaches that aim at making precise the functioning of idealization in model construction and testing in a way that may clarify which is the general procedure that underlies this kind of epistemic endeavour. An illustrious exception to this is Leszek Nowak's approach to idealization-concretization, which lies at the basis of the so-called Poznan School.

Another important issue is what amounts to saying that economic models are idealizations or the product of idealizations. Some authors have argued that, because of being idealizations or the product of idealizations, economic models should then be better understood as fictions and, hence, as ideal constructions rather than as genuine representations of real economic mechanisms [see, for an excellent survey, Morgan and Knuttila 2012]. As Morgan and Knuttila [2012] remind us, against the idea, defended by Cartwright [1989] and Mäki [2009a, 2009b, and 2009c], that economic models are abstractions from reality that try to isolate the causally relevant factors of real economic processes, fictionalists and other philosophers aim to stress that what economic models do is in fact create "parallel worlds" from which we can learn something about real economic systems [cf. Lucas, 1980, Sugden, 2002]. But how might this learning capacity operate? How can we gain knowledge about real economic mechanisms if our models are so highly idealized? Mäki, for example, ventures an answer: our capacity of learning about the target by making inferences from our models is that our models resemble the target in certain respects and with a sufficient degree of accuracy (Mäki, 2009b and 2009c). Sugden's answer, which at least in this point is similar to Mäki's, has to do with the fact that our models must be *credible* in order for us to be capable of using them in a profitable way to make inferences about the real world. My own answer, which relies on a different conception of the role of idealizations in scientific theories, will differ from both authors.

A third point which I try to focus on   is whether, because of their idealizing character, that is, because of the fact that they rely on idealizing assumptions that depart from what we know really to be the case, economic models can be considered to have a fictional character. One remark that can be made is that being the product of a process of idealization is not

the same as being a fiction. Models are not the same as fictional entities[1]. The point is that we do not pretend that some non-existing things really exist. We do not make *as if* they were real systems, as if they had a real existence out there. Models' fruitfulness does not come from our pretending anything of them, but rather from our ability to extract counterfactual inferences from the comparison between a certain construction, characterized by certain theoretical principles, and for which there is no way for it to be exemplified in reality, and the real economic situation we are trying to account for.

Finally, one point that I can only suggest here, but not develop, is that – as it is proposed in de Donato and Falguera [2016a, pp. 32–33] in relation to the referents of theoretical terms, ideal objects and scientific models in general – Max Weber's ideal types and economic models, as a special kind of scientific models, can also be understood as abstract artefacts, which are a subclass of the class of abstract objects[2]. Abstract artefacts have two distinguishing properties: (i) they have well defined identity conditions that are given by means of a theoretical description (economic models have the identity conditions they have as a matter of theoretical description), and (ii) they are constituted by human minds (i.e. they are the product of idealizations made by economists in order to obtain certain advantages from their use). So, accordingly, a view committed to abstract objects does not need to understand them as Platonic entities (in particular it does not need to say that they are independent from our minds). Once accepted that they are mind dependent, the central question turns out to be how much dependent they are in order to determine how much reality matters in the construction and evaluation of our models.

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[1] This critique against the idea of taking models to be fictional entities is developed in de Donato and Falguera [2016b].

[2] In de Donato and Falguera [2016a, pp. 32–33] we rely on Thomasson's notion of the abstract artefact, but see also de Donato and Falguera [2016b]. The idea of identifying ideal types and economic models with abstract artefacts is only suggested here. We leave a reasoned development of the idea for another occasion. More about the proposal of scientific models as abstract objects (artefacts) in de Donato and Falguera [2016a, 2016b].

2. The concept of ideal type in economics

As said before, it has been a *locus communis* to speak of the idealizational character of economic models and, in fact, of idealization as one of the essential aspects that characterize scientific models. The reason, clearly, is that idealization plays a central role in model construction in the natural as well as in the social sciences and the humanities. One may, then, want to ask whether this role is identical in both kinds of sciences? For example, it is curious to note that Max Weber's concept of the ideal type is proposed as something peculiar to the social sciences in front of the natural sciences. According to Weber [1904/1949], the social scientist should not proceed as in the natural sciences, trying to subsume, in a systematic or synoptic way, observational statements under general laws, whose discovery would be the aim of their science. They should aim at providing explanations of particular events through hypotheses that refer to an alleged causal relation between these events and other particular events. This is so because it is the particular phenomenon, in its singularity, which social scientists are interested in (this is the so-called "idiographic" conception of explanation that Weber attributes to the social-historical sciences). Their aim is not to establish a general law and, then, to subsume the phenomenon to be explained as a particular instance of the law, but rather to explain a particular phenomenon. The use of ideal types should help the social scientist to do this task. As it is well known, for Weber there are two other main differences between the social and natural sciences besides this idiographic conception of explanation, which is peculiar to social explanations, namely, the fact that social sciences are value relevant in their choice of problems (though they should remain neutral at the methodological level) and the fact that they typically require *understanding* action (which is not the same as explaining phenomena).

It would be, then, a central issue for philosophers of science to know more about the logical status of these ideal types and about how to construct them, but unfortunately Weber [1904/1949] is only very imprecise here. According to him, ideal types are not exactly hypotheses, though they can have a heuristic function and help to construct hypotheses. They are

not class concepts, but rather *limiting* concepts constructed by a process of the synthesis (in German: *Zusammenschluß* or *abstrahierende Zusammenfassung*) of many diffuse, more or less present and occasionally absent, concrete individual phenomena, which are arranged, according to certain accentuated points of view, into a unified analytical construct [see Weber, 1904/1949, p. 90]. In a famous passage, Weber says that an ideal type is to be seen as a "construct in itself [which] is like a *utopia* which has been arrived at *by* the analytical accentuation of certain elements of reality." [Weber, 1904/1949, p. 90] The use of ideal types makes it possible to understand concrete social or historical phenomena by comparing the ideal type and the concrete phenomenon. In this sense, *homo oeconomicus*, the capitalist system of production, the handicraft economy, or the neoclassical firm are just ideal types that allow us to provide some understanding of what happens in real economic systems. They all are limiting concepts which can not be fully exemplified in reality. In this sense, they resemble ideal concepts (abstract objects of a special kind) of the natural sciences,[3] such as a perfectly rigid body, perfectly elastic body or ideal gas. As we are going to see, they are concepts which not only are not exemplified, but, moreover: they *cannot* be exemplified (or if they can, only in a very approximate way).

Weberian ideal types, as used in the social sciences, resemble ideal concepts of the natural sciences in the sense of equally belonging to some theory or model and of being constructed to produce counterfactual explanations of real phenomena in terms of deviations from the model. The main difference Weber sees between them lies in his *idiographic* conception of explanation in the social-historical sciences – that is, the alleged fact that ideal types, as used in the social-historical sciences, seek to explain a particular phenomenon or event and perhaps not (or only with reservations) to explain a collection of particular events. But, as far as other matters are concerned, the similarity is almost complete. This issue has been, nevertheless, seen as controversial. For example, well known authors

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[3] In de Donato and Falguera [2016], we have defended the view that ideal objects are a kind of abstract object, one that is defined by idealizing, counterfactual conditions.

of the received view in the philosophy of science, such as Brown [1963] and Hempel [1952/1965], have distinguished between extreme types and idealizations, for both extreme types are end points of a series that is ordered by certain criteria. But whereas Hempel identifies ideal types with interpreted theoretical systems which contain idealizations, for Brown (some of the) Weberian ideal types are extreme types (and not idealizations), for example: pure folk society, a protestant sect or *Gemeinschaft*. The main difference between them is that idealizations are assumptions of conditions that are physically impossible, whereas this is not the case of extreme types: pure folk societies or pure communist countries do not in fact exist today, but they could exist "in the sense that they are not physically impossible" – to use Brown's words [1963, pp. 179–180]. According to Brown, idealizations are extrapolations of a limit value of certain variables. For instance, in perfect rigid bodies, i.e. those in which the distance between any two points remain the same, if a force is applied to it at any point, then that force must be transmitted instantaneously to all other parts of the body, which amounts to say that the force must be transmitted with infinite velocity. The exemplification of these idealized conditions is, in fact, *physically impossible*: from the point of view of the special theory of relativity, a force cannot be transmitted with a velocity greater than the speed of light. Nevertheless, the concept of the rigid body is used in relativistic physics. A similar example, also from physics, is the concept of the mass point. This distinction between extreme types and idealizations recalls Suppe's [1989, pp. 94 ff.] distinction between abstraction (that refers to conditions that are causally, nomologically possible) and idealization (that refers to conditions that are not causally possible).

A paradigmatic example of idealization in economics has been already mentioned, namely, that of the economic man (*homo oeconomicus*). As with the concept of an ideal gas, the economic man involves certain ideal assumptions that, according to economic theory, characterize the concept, such as assumptions referring to the complete rationality of the economic man or to perfect mobility in all economic adjustments. About these assumptions, Brown asserts [1963, p. 181]: "It is obvious that each [of them] is unsatisfiable – is physically impossible – in our world". However,

though we can accept that it is difficult for a great part of these assumptions to be met in reality according to the laws of psychology (as with the assumption of perfect rationality and entire independence of action with regard to all other persons and to social and cultural prejudices) or even the laws of economics (as to assume that there is no way of acquiring goods except through production and free exchange in the open market), it is clear that these assumptions do not contravene any of our physical laws.[4] So, they are not physically impossible, as Brown pretends. In fact, an economic theorist like Frank Knight, in his presentation of a theory of perfect market, considers that the assumptions behind the model are "idealizations or purifications of tendencies *which hold good more or less in reality*" [Knight 1920, p. 79; my italics]. Of many of the economic assumptions one could say that they are possible to be met in the real world either in a logical or in a physical sense, though they are not possible in another sense (psychological, perhaps even economical). More recently, Pettit [2002, pp. 231 ff.] has discussed this example and maintained that, if we construe the economic man in terms of self-regarding desires, the resulting creature would certainly run counter to commonsense experience [Mäki 2002, p. 19], though the construction would be relevant, at least under certain suppositions, in certain areas of market behaviour. But, clearly, the assumptions frequently associated with the economic man are not just restricted to self-regarding desires, as the economic man usually is characterized in terms of the maximization of utility as a consumer and profit as a producer. Besides, it is commonly assumed that the economic man is rationally consistent and that he tends to pursue the optimization of his own self-interest. So, it seems that the economic man is a pure abstraction, where the properties are so difficult to be met that the figure becomes just a fiction.

Like Brown, Hempel [1952/1965] distinguishes between extreme types and idealizations. For Hempel, Weberian ideal types would correspond only to the latter and not to the former. Examples of extreme types in the Hempelian sense are psychological concepts such as purely extrovert or

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[4] One possible exception would be those assumptions, often made in economic models, that introduce the infinite divisibility of goods. This would imply a physical impossibility.

purely introvert personalities, of which concrete instances are rarely if ever found, but which can serve as end points of a series. According to Hempel, ideal types in theoretical economics are similar to the idealizations in the natural sciences. He sees, however, two main differences: on the one hand, idealizations in economics are intuitive rather than theoretical, in the sense that the postulates or hypotheses that correspond to these idealizations are not deduced "from a broader theory which covers also the non-rational and noneconomic factors affecting human conduct. No suitable more general theory is available at present, and thus there is no theoretical basis for an appraisal of the idealization involved in applying the economic constructs to concrete situations" [Hempel 1952/1965, pp. 169–170]. On the other hand, the class of concrete behavioural phenomena that the economist attempts to idealize is not always clearly specified. Nevertheless, Hempel says that, in spite of the differences, ideal types are not something exclusive to the social sciences and they exhibit essentially the same idealizational nature as the ideal concepts from the natural sciences. More exactly, ideal types are not concepts, but idealized theories, like the theory of ideal gases[5].

Max Weber provided two approaches to ideal types in the social sciences, one more focused on the idea of extreme types [see Weber 1904/1949], the other more elaborated – and the idealizational character of the ideal types is specially highlighted [see Weber 1921/1988].[6] Ideal types in the first sense are as we have already described them, that is, concepts that are the result of an abstraction process: they refer to properties that are very difficult to be exemplified in the real world, they are concepts that the theorist construes for explaining particular social phenomena in his singularity. They are more extreme types in the sense of Brown. Examples

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[5] Nagel's [1963] contribution to the problem is similar to that of Hempel: the acceptance of an ideal type generalization is justified only in virtue of its being a limiting case of a more general system of hypotheses which are capable of independent empirical corroboration. Papineau [1976] rejects both accounts (Hempel's and Nagel's) and suggests a new account of ideal types, justifying them in the context of Lakatos's methodology of research programmes.

[6] This chapter, entitled "Soziologische Grundbegriffe", appeared some years earlier as an independent article.

of them would be capitalist culture or the handicraft industry. Ideal types in the second sense are more like idealizations in Hempel's sense and have a counterfactual character, explicitly noticed by Weber [1921/1988], the *homo oeconomicus* being a paradigmatic example of this. In any case, the counterfactual character is also present in the first conception of the ideal type, as extreme types are never exemplified in reality. Both characterizations of ideal types make reference to a process of abstraction as well as to idealizations[7].

Curiously, Nowak [1980] relates the method of idealization in economics to Marx's methodology of abstraction, not to Weber's ideal types. Nowak makes his own interpretation of Marx's abstraction as the method of idealization and concretization, reconstructing in this way some of the laws of *Das Kapital*. Nowak does not attribute the use of the idealizational method to Weber and, since for Weber all Marxian constructs are ideal types, he tries to show that Weber's conviction is false, that is, according to Nowak, Marx would not have used Weberian ideal types, but the method of idealization [see Nowak 1980, chap. 3].[8]

Weber (1921/1988] is perfectly aware of the counterfactual character of idealization, which here also involves a causal explanation of particular events: the idealized concepts and laws of theoretical economics "represent how a certain human action would have been, if it had been oriented by strictly rational (economic) aims and devoid of any influence of errors or emotions" [Weber 1921/1988, p. 548]. All errors and emotional influences are seen as *Störungen*, that is, as deviations or disturbing factors. At the same time, all these irrational deviations of an idealized human action are a subject of study from a sociological or a psychological perspective. As we have said, the Weberian ideal types should help to construct hypothetical causal explanations (which are empirically testable). To check the va-

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[7] In fact, when Weber discusses the construction of the concept of the "economic subject" in his unpublished lectures on economics, he explicitly mentions, on the one side, the omission of factors (abstraction) and, on the other, the idealization of assuming that there are certain properties which are not really there. See Weber 1990, p. 30. I am particularly indebted to one of the reviewers for this remark about Weber's text.

[8] For an actualized comparison between Nowak's notion of idealization and Max Weber's ideal types, see Godek, 2016 and Halas, 2016.

lidity of idealized laws, we have to compare our hypothesis with the real result of the action to which it refers. If the comparison involves statistics, then it can be made with a certain degree of precision and can be used as a guide to make inductive inferences. There are cases in which the comparison takes place through the method of isolating the cause by thought experiments [Weber 1921/1988, p. 549]. The procedure suggested here by Weber resembles Nowak's method of idealization. More specifically, Weber requires the negligence of parameters that are conceived as secondary or as not having a strong causal influence.

In his classical paper about the methodology of positive economics, the Nobel Prize laureate in economics of 1976, Milton Friedman, also shows the importance of the role of ideal types in economic theory, and provides examples such as perfect competition and the monopolistic firm. According to Friedman, these ideal types are not intended to be descriptive, but "they are designated to isolate the features that are crucial for a particular problem" [Friedman 1953/2009, p. 36]. Economic theorists should not test the theory by directly testing its assumptions, but rather the assumptions, which are descriptively false, should facilitate an indirect test of the theory by its implications. As Friedman says, there is no point in criticizing a model (or a theory) – and its assumptions – as being not realistic, because a completely realistic theory – in economics or in any scientific field – would be useless [Friedman 1953/2009, p. 32][9]. This recalls Jorge Luis Borges' claim on the realisticness of maps and their utility: a map on the scale 1:1 would cover the whole place through which one wants to orient themselves and, therefore, would be of no use. As we are going to see, this point is connected with a certain criticism of Sugden's conception of economic models as parallel realities that should be credible in order to work [see de Donato and Zamora 2009, pp. 114–117].

If we look at Machlup's early ideas on the nature of economic agents, we also find the idea that heuristic fictions such as *homo oeconomicus* or neoclassical firms are to be understood as ideal types not to be confused

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[9] See, however, Mäki, 2009a for an interpretation of Friedman's approach in terms sympathetic to the realist.

with any real system [Machlup 1978, p. 298]. In fact, he proposes to substitute the common term for one which he considers to be much more adequate, namely, that of *homunculus* oeconomicus. But, when he tries to make this concept precise, he seems to see it as a "mental construction". This may be seen as correct if by mental construction he means a construction that is a product of the human mind, but not if the construction is thought to be a merely subjective representation. That is, we can retain Machlup's idea if we think of *homunculus oeconomicus* more as an abstract construction depending on a theoretical characterization and, hence, on a human mind, and not as a concrete mental entity or as an event in the brain.[10]

3. Ideal types are abstract objects

How then to conceive ideal types? I contend that the best way to understand them is as abstract objects. They are gained, as Weber recognizes, by a process of abstraction. Regarding the concept of *homo oeconomicus*, J.S. Mill also makes a similar observation, as for him the notion focuses on the selfish interests of an economic agent and "makes entire abstraction of every other human passion or motive" [Mill 1836, pp. 321–322]. As Morgan [2006, pp. 5–6] puts it, "Mill's process for arriving at this *homo economicus* might well be described as following a simplification or (isolation) strategy, subtracting away a whole lot of non-economic aspects of human behavior to focus on the narrowly economic." But Mill does not treat the economic man as having just economic properties. He treats him as motivated by the desire of acquiring wealth and with the ability to obtain this end effectively [Morgan 2006, p. 5].

As we have seen, Weber contemplates at least two ways in which ideal types can be construed: (i) by omitting causal factors that are known to

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[10] For a discussion of Machlup's idea in the context of the debate on economic fictions, see Knuttila, 2009, p. 209, and, for a discussion of the concept of the economic man with a historical and philosophical perspective, see Morgan, 2006.

play a role in reality; and (ii) by idealizing certain properties that are known to be instantiated, though not in a so highly idealized degree. By following the first procedure, ideal types such as the economic man are construed. By means of the second way, we may construe ideal types such as the capitalist industry. We also find examples of ideal types that seem to be the product of combinations of both procedures. This is the case of the neoclassical firm, whose definition presupposes an abstraction of causal factors as well as the idealization of certain features. Neoclassical firms are typically defined in terms of profit maximization and cost minimization, making the input's price equal to the input's marginal product value to the firm [Conner 1991, p. 123]. In this sense, it is said that neoclassical firms are treated as black-boxes where other features clearly exhibited by real firms are not taken into account (by means of a process of abstraction). But this ideal type of firms is also put in the context of a perfect competition scenario, which clearly involves highly idealized assumptions, such as pre-supposing that "all parties have perfect and complete information" or that the "resources are completely mobile and divisible and hence flow unim-peded to the highest-valuing use." [Conner, 1991, p. 123]. This kind of ideal types are the product of a process of abstraction as well as of idealiza-tion and the result is a kind of entity that is known to possess no reality, being mere models representing firms as cost curves, and hence devoid of any concreteness. Infinity assumptions typically fall under this category too. As Friedman [1953/2009, 35] recalls, atomistically competitive firms are defined in terms of the infinite elasticity of the demand curve with re-spect to the price of the product and all outputs, so that these firms consti-tute another clear example of an ideal type in economic theory. Can these firms be concrete? Can the economic man be concrete? It seems plausible to answer these questions in the negative. This is not only because in this world, given what we know from real economic systems as well as from psychological and sociological facts, these kind of entities cannot be ex-emplified, but also because they seem genuinely abstract as far as they are models that aim at representing economic systems.

Economic models (visual, mathematical, or simulation models) seem to belong to a different category as possible concrete entities. They are the

result of a process of fiction relying on several idealized assumptions, but they are not exactly like fictional characters, which – at least in fictionalist accounts of fiction – are seen as nonexisting objects. There are authors that conceive fictional characters as abstract objects too [see Thomasson, 1999, Zalta, 1983 and 2003]. According to this view, instead of saying that the name "Sherlock Holmes" lacks of reference, it is said that "Sherlock Holmes" refers to an abstract object, which is characterized in terms of certain properties attributed to it by the fiction in question (Conan Doyle's stories about the famous fictive detective). There seems, nevertheless, to be a difference between fictional characters and models, namely, that models and structures, as well as numbers, seem to be constitutively abstract, whereas mere *possibilia*, like Sherlock Holmes, could be thought to be concrete in the world in which they were instantiated. A fictional character, if it were real, would be a concrete object having causal powers and a spatio-temporal nature (just in the world in which it exists). But we could ask if this could happen to numbers, models, or structures? In any case, it is not crucial to take here a position regarding the modal status of abstract objects. In Zalta's view, abstract objects are necessary entities and cannot be concrete (in any world that is possible). For us, it suffices to accept that economic models are abstract objects and not mere non-existing entities. And, in line with Thomasson [1999], we can say that they are abstract objects not in the Platonist sense, but abstract artefacts created by scientists with the intention of accounting for real economic systems.[11] What we do in comparing real economic systems with economic models is to compare the properties we observe real economic systems have with the properties that we attribute to the objects in our models. And this operation may lead to extract inferences and serve as heuristic devices to create new and more

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[11] This suggestion cannot be developed here, and I leave it for another occasion. For an extended defence of theoretical entities and ideal objects of science as abstract objects, see de Donato and Falguera, 2016a, and for a similar defence of models as abstract objects, but more careful and developed than the one presented in this paper, see de Donato and Falguera, 2016b. The idea of linking Thomasson's abstract artefacts with theoretical entities and ideal objects as abstract objects is suggested in Donato and Falguera [2016a, pp. 32–33]. In the future, we expect to continue applying these ideas to other cases, including economic models.

specific models in order to improve our theories. Let us see in the next section how this work is carried out.

4. The relation of models to reality

There have been realist as well as antirealist interpretations of scientific models, and economic models have not been an exception. As Hausman [1998] argues and Reiss [2012] recalls, the realism/antirealism debate, in the philosophy of economics, seems not to be focused, like the traditional debate in the philosophy of science, on the problem of the existence of unobservables. It is rather oriented towards a different issue, namely, the role of economic models and their relation to real economic systems. Seen in this way, the debate seems more an epistemological than an ontological debate. In principle, then, I agree with them, but I think that the problem of *what models are*, to which the first sections of this paper were devoted, is also part of the debate. And in this sense, the debate turns out to be also ontological.

In this section, I will briefly focus on the relation of models to reality. A realist position regarding economic models claims that economic models may said to be true of the real world, that there is a fact of the matter that renders economic models to be correct or approximately correct and, hence, we can speak of true economic theories. Authors that recognize the strong idealizational component of scientific (economic) models may also want to claim this form of realism. Among them, Uskali Mäki [2009] considers his form of realism to be thin and flexible, but still, for him, "there is a fact of the matter concerning the ways of the world and whether our theories have got those ways right, and that, normatively, it is the task of science to get them right" [Mäki 2009, p. 75]. As he argues, the fact that economists make unrealistic assumptions in the models they use does not necessarily imply that we have to adopt an antirealist philosophy about models. It is possible to adopt a realist view even if one recognizes that economic theories are partial and contain many idealizations. Niiniluoto [2002] also offers a realist approach to economic models by seeing ideali-

zations as vehicles of counterfactual reasoning about the world to which the notion of truthlikeness can be appropriately applied. On the other side, instrumentalists contend that models are just – to put it in Reiss' words – "devices for orienting themselves in this world" [Reiss 2012, p. 365]. For them, truth is not relevant or is directly substituted by the reliability and fruitfulness that models should exhibit in order to be good, that is, for predicting and accounting for phenomema.

An initial problem for realists is how to treat common idealizations that seem quite improbable, or even impossible to be met, such as "perfect knowledge, zero transaction costs, full employment, perfectly divisible goods, and infinitely elastic demand curves", that – as Knuttila [2009, p. 211] says – are "commonly made [in economics]". As Sugden notices [2002, p. 117], instrumentalists have no problem in adequately accommodating the sense of making idealizations, as they are interested just in the usefulness of models and not in their truthlikeness. If we apply instrumentalist intuitions to the understanding of neoclassical models, it seems that this view functions very well as far as the models are sustained by empirical evidence. The problem arises when we try to make sense of the way we use other models, such as Akerlof's and Schelling's, that are posed by Sugden as examples of reasoning devices that seem to aim at connecting real causes with real effects.

However, a realist like Mäki may also try to make sense of the role of idealizations in economic models, as he embraces Cartwright's idea of the isolation method, according to which the idealizations put into the model come in the form of neglecting certain causal factors that are considered to be not relevant and describing imaginary situations in which only some essential parameters are thought to be influential. In this sense, idealizations are not errors, but rather "strategic falsehoods" [Mäki 2009, p. 78]. Mäki also traces an analogy between isolation and experiment and, by this means, he highlights the connection of models to the world and tries to convince us of the fact that unrealistic assumptions are needed "to get the truths about limited but causally significant aspects of reality" [Mäki, 2005, p. 1731]. A more accurate view of real economic systems may be gained by de-idealizing our initial assumptions and by allowing our models

to be more complex than initially considered, putting more causal factors as having an influence in the economic processes we are trying to account for (Mäki follows here Nowak's [1980] and McMullin's [1985[approaches to Galilean idealization; Niiniluoto [2002], also follows Nowak's conception of idealization).

Cartwright [1999], Frigg and Hartmann [2006, section 5.1.], Alexandrova [2006], and Reiss [2012], among others, have nevertheless called into question – at least in the case of economics – the possibility of arriving at more accurate and realistic representations of real systems by de-idealizing from our initial idealized models, and argue that economists don't really proceed in this way but rather consider rival models where several new aspects are taken into account. Idealizations in the economy are made for reasons of tractability and convenience, in order to extract inferences and to try to apply them to real systems, rather in terms of the isolation of causal factors. "Thus the assumptions needed to make the model mathematically tractable threaten the very idea of isolation, because then the problem concerns not only the unrealisticness of the assumptions but also the model dependence of the results derived" [Knuttila 2009, p. 212].

For Morgan [2002], for instance, it becomes clear that in order for models to be useful, we need to supply them with a narrative that makes sense of them by pointing out what is relevant in them and how are they to be applied to the economic world. Only this allows us to use our models for the understanding of what is going on in the real world.

As already mentioned (in the first section), a rival approach aims to stress that what economic models do is in fact to create "parallel worlds" from which we can learn something about real economic systems. This is something paradigmatically defended by Sugden's [2002] credibility approach. Sugden claims that our models must be credible in order for us to be capable of using them in a profitable and successful way to make inferences about the real economic world. In de Donato and Zamora [2009], I have criticized this approach and, at the same time, I tried to highlight the convincing aspects of Sugden's ideas together with the advantages of the isolation approach. Our main aim in that article was to show how an infer-

entialist conception of models and representation could do justice to both conceptions of scientific modelling by allowing us, at the same time, to account for how we use models to understand and learn about the real world. In that paper, we contend that models are instruments for surrogative reasoning, a kind of "inferential prostheses", a very peculiar artefact constructed for epistemic purposes. In this sense, we agree with Knuttila [2009], though in the present paper I propose to conceive these artefacts as *abstract* objects (as Thomasson 1999 does in her book applying her theory to fictional characters). Knuttila says that she understands models as *concrete* artefacts: "[a]dopting a productive perspective requires one to address [models] as autonomous but also *concrete objects* that are constructed for *epistemic purposes*" [Knuttila 2009, p. 221; compare with Knuttila 2005, p. 48]. As far as the rest is concerned, I am still quite sympathetic with what she says on economic models.

It is true that, as we argue in de Donato and Zamora [2009], models do not form a natural class (there are very different, to a great extent heterogeneous kinds of models, from mathematical or analogical to material or simulation models), and we adopt here a pragmatic approach to models that understands them more in terms of their function than in terms of their nature, so that in that paper we can leave aside the ontological problem. But the position that I am arguing for in the present contribution does not contradict the pragmatic line defended in that paper. It is just a way of collecting those different ontological natures into one single category of a higher level, as the central aspect that determines the nature of models is not the particular form that they adopt, but rather the theoretical descriptions behind them.[12] Henceforth, Thomasson's [1999] approach can be of help at this point, as she conceives fictional characters neither as concrete *possibilia* nor as necessary *abstracta*, but rather as dependent *abstracta*,[13] abstract artefacts made by human minds, depending on specific descriptions that are found in narratives, stories, novels, and the like. In this sense, they are *not* Platonic entities, which are commonly though to be *independ-*

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[12] More about this in de Donato and Falguera [2016a].

[13] "Abstracta" is used throughout the article as a synonymous with "abstract objects".

ent from human minds and to have a non-spatial as well as a non-temporal nature. Economic models could be then understood as abstract objects in this sense, as models seem to be, on one side, characteristically abstract and, on the other side, construed by humans. Economic models, clearly, are made by human minds to serve as inferential prostheses, often telling us more about the intentions of the modelers than about the reality itself. As Piketty points out,

> [m]odels can contribute to clarifying logical relationships between particular assumptions and conclusions but only by oversimplifying the real world to an extreme point. Models can play a useful role but only if one does not overestimate the meaning of this kind of abstract operation. All economic concepts, irrespective of how "scientific" they pretend to be, are intellectual constructions that are socially and historically determined, and which are often used to promote certain views, values, or interests. [Piketty 2015, p. 70]

Models are evaluated not in terms of an alleged correspondence to real economic systems, which often is not only difficult but even impossible to corroborate, but rather according to the virtues and advantages they give to us in our functioning with our theories and in their application to the usual economists' duties. Virtues as the numbers of questions they answer, how coherent they are with the background knowledge, how manageable they are, how versatile and how fruitful they are in allowing us to make inferences and conceive and predict new situations. For this matter, economists commonly introduce idealizations of various degrees that are made at different levels: (i) the abstraction and selection of parameters (isolation), that are a sort of idealization too, as involves counterfactual reasoning applied to the choice of variables; (ii) counterfactual deformations introduced in the parameters considered within the model, which are the kind of suppositions that are more usually called "idealizations" in the literature; (iii) idealizations made during the process of calculating and measuring these parameters and in the construction of data models; (iv) idealizations involved in the simplified form of laws and principles; (v) idealizations needed in approximation relations between laws and theories; (vi) idealizations that are taken into account in the elaboration of computer-model simulations [see de Donato and Zamora, 2009, p. 111].

As it is argued in de Donato and Arroyo [2012, p. 12], idealizations can be considered from at least two points of view: on one side, as a method or mental process by means of which we arrive at a model, at an ideal type or concept; on the other, as the product that results from that process (a law, a model, a statement, a concept, etc.). Sometimes we say that a model is *idealized* or that a law is *idealized*. The models, the ideal types or the ideal objects which the law is about, could be then seen as abstract objects that result from the process of idealization (considered here as a mental process of counterfactual deformation). So, we could then say that idealization is or typically involves a process of counterfactual deformation by means of which we obtain, as a product, a law, a model or an ideal type. If, as a matter of simplification, we could consider idealizations to be statements that hold under certain idealized, hypothetical or counterfactual conditions, as I have proposed in de Donato and Arroyo [2012, pp. 16–17], idealizations could be then seen as statements (S_i) that are the consequent of a counterfactual (or subjunctive) conditional, in which the antecedent expresses the ideal conditions (C_i) under which the idealization holds. We would then get the following structure: "$C_1 \wedge \ldots \wedge C_n \Rightarrow S_1 \wedge \ldots \wedge S_k$", where $C_1,\ldots, C_n$ are the ideal conditions, $S_1,\ldots, S_k$ are the idealizations, and the connective "$\Rightarrow$" stands for a counterfactual conditional that could be modelled in terms of Lewis' modal semantics. $S_1,\ldots, S_k$ would be the idealized statements that express an (idealized) law or serve as the linguistic description of a model or an ideal type, whereas $C_1,\ldots, C_n$ would refer to certain counterfactual or subjunctive conditions under which those idealized statements hold. Typically, the antecedent, formed by the conjunction of the C_i's, would make reference to certain parameters or factors that are neglected, whereas $S_1,\ldots, S_k$ would typically express some ideal relations holding between certain magnitudes (at least in this respect, this analysis would correspond to Nowak's [1980]). Moreover, $C_1,\ldots, C_n$ would have different "degrees of deformation" in the sense that they are able to contradict from principles that are generally accepted to empirical claims, finishing with the case in which the proposition assumed is completely hypothetical. At the highest degree of deformation, $C_1,\ldots, C_n$ are completely idealized in the sense that they contradict some universal prin-

ciples or in the sense of being completely impossible to be met, but that are, notwithstanding, made, in many cases, for mathematical convenience and tractability (in the case of economics, infinitely elastic demand curves could be an example of this). Then there is the case in which $C_1,\ldots, C_n$ are contingently false but conflict with well-established empirical regularities (for instance, psychological or even economic regularities), such as the idealizations made in the neoclassical models and those regarding the economic man. A third case is that in which $C_1,\ldots, C_n$ are contingently false but do not conflict explicitly with a well established regularity. In any case, we have strong reasons to believe that they are false in the actual world or that usually they are not met (assumptions like full employment are of this type). Finally, $C_1,\ldots, C_n$ can be purely contingent assumptions that, despite not seeming plausible, we do not even know if they are true or false in the actual world. These would be the assumptions that play the role of contingent hypotheses (like let us suppose that inflation were to continue at a given constant ratio for a period of a few years, which may be true or not).[14]

These assumptions may occur, of course, in combination and are not exhaustive. The core idea is that a theory (or a law, a model) consists in idealizations that hold under conditions ranging from the most idealized, to the hypothetical assumptions we mentioned at the end. And the essential point is that, if we look for a theory with heuristic, epistemic and cognitive virtues, we need assumptions of different degrees of idealization. If we had only highly idealized assumptions, it would be practically impossible to have concretizations of some kind, because they would have no realistic connection to the actual world. However, theories have their great explanatory power precisely due to these highly idealized conditions and, for this reason, these assumptions are frequently needed in order for models to do their work.

Contrary to Sugden's [2002] approach, according to which idealizations should describe credible counterfactual worlds in order to give us

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[14] See, for all this, de Donato and Zamora [2009, pp. 113–114], and also de Donato and Arroyo Santos [2012] for an application of these ideas to the case of biological theories.

some warrant for making inductive inferences from our models to the real economic world, our account allows economists to pick up a set of hypothetical and counterfactual assumptions of different degrees of idealization in order to formulate different kinds of inferences (not just inductive inferences) and in order to construe new models, employing those available as heuristic devices. Economic models usually employ infinite assumptions for reasons of tractability or may describe impossible situations when they describe them by means of mutually contradictory theories. Models, in these cases, are not credible but they are not therefore useless. Quite the contrary, they prove to be very "enlightening" [see Grüne-Yanoff, 2009, Kuorikoski and Lehtinen, 2009, and de Donato and Zamora, 2009].

This is the reason why I think that, as we show in de Donato and Zamora [2009], the likelihood or realisticness of models is not a good measure for their acceptability. Certainly, realisticness and likelihood must be qualities of *some* of our assumptions and hypotheses, but not of all of them. "Unrealistic models are valuable, on the other hand, because (and when) they show us how to fruitfully apply to new cases the theoretical principles and inferential norms we knew from before, but were unable to use in those cases" [de Donato and Zamora, 2009, p. 117].[15] So, the parallel worlds that economists create are not always so close to our world as to make them credible. They are often rather *in*credible and contain idealizations of such a higher degree as to render those parallel worlds far away.

5. Conclusion

Ideal types and economic models are abstract objects.[16] It is not that we make *as if* they were real systems. As Morgan says, models usually begin to work when supplied with a narrative, but this does not amount to

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[15] Compare this with Mäki [2009b], who tries to combine, from his own perspective, Sugden's idea of credible models with Hausman's account of models as explorations.

[16] See De Donato and Falguera [2016a and 2016b] for more details about the suggestion that theoretical entities, ideal objects and scientific models in general are abstract objects. See also de Donato and Falguera [2016b] for a more detailed criticism against fictionalism.

saying that they function like fictional characters. Models' fruitfulness does not come from our pretending anything, but rather from our ability to extract counterfactual inferences (and not merely realistic inductive conclusions as Sugden believes) from the comparison between a certain construction, governed by certain theoretical principles, and for which there is no way for it to be exemplified in reality, and the real economic situation we are trying to account for.

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Xavier de Donato Rodríguez,
Dpto. de Lógica y Filosofía Moral Facultad de Filosofía,
Universidad de Santiago de Compostela,
Praza de Mazarelos, s/n 15782 Santiago de Compostela,
España (Spain)
Tel. 00 34 981 563 100, ext.: 12537 Fax: 00 34 981 530 847
e-mail: xavier.dedonato@usc.es xavier_donato@yahoo.com