

DOGMAS

The utility function in economics: definition and problems

BY ALAIN GRANDJEAN

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Economists have long been battling over the origin of the value of things. One theory of value followed another until the so-called marginalist “revolution”, whose main concept is utility. Here, we’ll look at what utility is, how it’s used (particularly in economic models) and what its limitations are. We conclude with the importance of a “counter-revolution” in macroeconomics. Utility has led us down a blind alley: we need to break out of it radically. ¹

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01 —

Value-utility, the central concept of neoclassical economics

The question of the source of the value of a good or service has long been central to economics. For “classical” economists² and Marxist economists, what determines the value of a good or service is the amount of labor required to produce it.

Marginalist economists (referred to here as neoclassical) consider this value (from which they deduce the price) to be the measure of an economic agent’s desire for the good or service. It’s a subjective, individual assessment, linked to the individual’s preferences given his or her current situation.

More precisely, what makes value for these economists is the notion of marginal utility. To take the well-known example of the glass of water, a thirsty man in the desert is prepared to pay a “fortune” for one glass of water, a little less for the second when he has already drunk, even less for the third, etc., regardless of its production

value. Neoclassical theory adopts this conception of value as linked to the utility generated by the last unit exchanged. For them, price formation depends solely on this marginal utility.

This “theory of value”³ permeates all neoclassical economics. Economic agents are assumed to be “rational”, i.e. to maximize their “utility function” (utility can be represented by a mathematical function), under budgetary constraints. This function cannot be observed or measured, but it is omnipresent in reasoning.

1.1 THE MATHEMATICAL REPRESENTATION OF THE UTILITY FUNCTION

Microeconomic theory⁴ mathematically represents, through a utility function, the preferences of economic agents (individual preferences that are the source of their decisions).⁵ and makes assumptions about the (mathematical) properties of this function.⁶ Note that this utility function can be “intertemporal” and assumed to represent the preferences of economic agents between several options (baskets of goods or leisure consumption trade-offs) over a potentially infinite duration.

Microeconomic theory then derives a series of “results” (including those of the Nobel Prize winner⁷ Gérard Debreu³), such as, for example, the demonstration of the existence of a competitive equilibrium, which is still the basis of many studies in theoretical and applied economics today). But these results depend fundamentally on this conception and, of course, on any additional assumptions made. They are therefore as debatable as this conception of value and utility!

We refer the discussion on the supposed [rationality of economic agents](#)⁸ to another sheet.

02 —

Value-utility theory ignores Nature

Based on the “microeconomic” conception of value outlined above, “neoclassical” economists have justified a theory of “social well-being”, an aggregation of the utility of economic agents (supposed to represent their degree of satisfaction). This individualistic vision of society, and of what might characterize its “social optimum”, has been the subject of much debate in the field of social justice. ⁹

We will limit ourselves here to pointing out that it ignores Nature and the pressure that humanity exerts on it. If social well-being is based solely on the satisfaction of individuals, economic costs (see [What is a cost?](#) ⁸) are by definition only “utility losses”: withdrawals from Nature, or even its destruction, are therefore only economic costs if they create a loss of utility. However, this is not necessarily the case at any given moment: destroying an unused “virgin” space costs nothing! More importantly, the destruction of nature, which would bring more utility than it would reduce, is considered, in this conception of value, to increase social well-being. This is how public decisions are rationalized in cost-benefit analysis. ¹⁰

For a neoclassical economist, the best approximation of the cost to the community is the loss of GDP. ¹¹ (GDP is often considered an approximate measure of social well-being). It is therefore rational to destroy Nature in order to improve this well-being, and uneconomic to conserve it if this is done “at the expense of GDP”.

2.1 THE ENVIRONMENT AS AN “EXTERNAL” COMPONENT OF ECONOMIC REASONING

If the neoclassical economist is interested in the “environment”, he does so within the framework of his reference model. The environment is an externality¹² The environment is an “externality”, positive or negative, i.e. a component “external” to economic reasoning. The questions he asks are: what is the utility (= value) for the consumer of a “healthy” or balanced environment (versus a state where it is polluted or destroyed, partially or totally)? What is their “willingness to pay”?¹³ for it to remain so or eventually become so again? More precisely, this second question will be rephrased as follows, since our economist is a marginalist: what is our consumer’s willingness to pay for an “incremental” improvement in the state of the environment? This will then give a “price” to the incremental restoration action under consideration. If the market fails to produce an action at this price, the state will be keen to compensate for this “market failure” (see market module) by means of a tax (which increases the cost for the “polluter”) or a subsidy (which reduces the cost for the depolluter).

This current of thought (attempting to “reintegrate” the environment into neoclassical economic analysis) was initiated by Arthur Pigou, to whom we owe the notion of the ecotax. It was enriched by the contribution of Ronald Coase,¹⁴ and other economists behind tradable quotas¹⁵ (Crocker in 1966, who discussed their application to air pollution, and Dales in 1968, who proposed this instrument to limit water pollution).

There has been a great deal of discussion about the advantages and disadvantages of these two mechanisms (tax or quota).¹⁴ We’d like to stress here that, in all cases, the neoclassical current takes value-utility theory as its starting point. The result is a profound limitation in the conclusions that are drawn: they do not take into account planetary limits, and the cost to the human species of exceeding these limits.

Marginalist reasoning blinds us to what our “real costs” are: not the limits or frustrations of our desires, supposedly rationally unlimited, but the destruction of our planet’s ecological resources and conditions of habitability! This reasoning leads us to ignore the infinite value of these conditions for our species, and to prefer the infinity of our desires!

03 —————

Utility functions in macroeconomic models: totally unrealistic assumptions

From the 1980s onwards, the neoclassical economists’ intellectual offensive against Keynesian macroeconomics focused on its lack of “microfoundations”.¹⁷ For neoclassical economists, macroeconomics must derive from microeconomics and the behavior of individual agents.¹⁸ Consequently, they disqualify macroeconomic models that use “non-microfounded” aggregate equations. The ideological background is always the same: only individuals exist, there is no autonomy of the social, and even institutions must be interpreted as deriving from individual choices. Similarly, macroeconomic results (unemployment, inflation, trade deficits, etc.) can only result from individual decisions.

To make this connection, macroeconomists¹⁹ then used utility functions, founding what would become known as the new macroeconomics²⁰. This gave rise to the so-called RBC models²¹ then general equilibrium, DSGE²² models, which are still used by major institutions – even if the 2008–2009 crisis dealt them a severe blow.²³ due to their inability to see it coming.

Initially, macroeconomists simplified the mathematical representation of the economy by using a single “representative agent”.²⁴ maximizing a utility function and supposed to represent all economic agents. This simplification obviously poses a number of problems: these models fail to take into account social inequalities and, more generally, the diversity of consumer preferences. However, this is not just a technical or mathematical difficulty. The question of aggregating preferences and representing them in the form of a demand function in fact poses unsolvable problems, well explained by Steve Keen¹ and Bernard Guerrien.

In addition to this initial simplification, the models must make the assumption of “rational expectations” (see box). Not only is the incredible diversity of economic agents reduced to a single “model” of behavior, but this model is clearly totally unrealistic.

The rational expectations theory

In 1972, economist Robert Lucas popularized the term²⁶ the concept of rational expectations, introduced by the economist John Muth in 1961 and later developed by Thomas Sargent and Neil Wallace. The idea is that agents would be able to take advantage of all available information to anticipate, so that on average, they would not be wrong. In other words, they would be able to estimate (on average) future economic quantities as if they were determined by known information, which they would be assumed to know. This theory is obviously totally unrealistic, as economist Gaël Giraud explains:

“Neoclassical economists don't believe that everyone knows in advance how much snow Chamonix will have in the first fortnight of February 2020. They are more subtle than that. They believe that the price of a lift on the slopes at that

*time can be deduced, if you're clever enough, for example, from the weather obligations that protect against the risk of insufficient snow in the Alps in 2020... Softer madness on the surface, but madness nonetheless. Because, in this world where market prices are supposed to transmit all relevant information at all times, it is indeed enough to observe today's prices to deduce the future."*²⁷

Let us note here that the very famous DICE model, used by the “Nobel Prize winner”⁷ William Nordhaus²⁹ to assess the economic impacts of climate change, also uses an intertemporal utility function, based on economist Ramsey’s model³⁰ model. The core of the DICE model can therefore be considered completely unrealistic, and cannot claim to represent even remotely the evolution of economic reality. Other fundamental criticisms are mentioned in the above post. But the one relating to the utility function is fundamental.

04 —————

The methodological impasse of the utility function

The utility function poses at least four fundamental problems:

1. Whether at the microeconomic or macroeconomic level, a utility function is not observable. It is therefore impossible to determine its form empirically. In practice, economists use functions that have certain mathematical properties³¹ whose apparent common sense should not hide the fact that they are in no way based on

experience. In fact, the opposite is true: experimental economics tests show that these properties are not respected.


2. More generally, [the rationality hypothesis](#) ³² is strongly challenged by all the work in experimental economics and applied psychology.
3. Aggregating individual preferences poses formidable problems. They were identified by Kenneth Arrow in his “impossibility theorem”.³² and also emerge from work carried out within the neoclassical tradition. In 1975, in a famous series of articles, Hugo Sonnenschein, Rolf Mantel and Gérard Debreu ³³ proved that aggregate net demand (the sum of individual net demands) can have any mathematical form. It is then impossible to deduce, from the maximizing behavior of firms and households, conditions on the (mathematical) form of their aggregate net demand function. The economist Andreu Mas-Colell would later obtain the same type of result for the production function. ³⁴ All in all, this means that it is not possible to give a concrete meaning to an aggregate utility function; it will always be an abstraction that may be technically useful, but no more...
4. As we saw above, using the utility function in intertemporal choices, via the theory of rational expectations, is clearly a denial of reality. In no case does a human being reason in this way, nor is he capable of doing so.

05 —————

What you need to know about utility functions in economics

The use of utility functions in macroeconomic models and representations is based on the ideological desire to reduce macroeconomics to the aggregate of individual

decisions. However, macroeconomics cannot be reduced to microeconomics, if only because it is not possible to deduce aggregate utility, demand and production functions from the corresponding individual functions.

Although the methodological impasse is obvious, it has not yet been sufficiently recognized. Certainly, some renowned economists, such as former World Bank chief economist Paul Romer ³⁵ Nicolas Stern ³⁶ Steve Keen ³⁷ Gaël Giraud ³⁸ and, before them, Bernard Guerrien ³⁹ have sounded the alarm with vigour and solid arguments. But this is still not enough, as the work on the [economic effects of climate change, which are seriously underestimated](#) , unfortunately shows.

It's time to stop believing in the conclusions of models based on representations as far removed from reality as these individual or aggregate utility functions.











It's time to rethink our concepts of cost and value, which implicitly justify the destruction of Nature and fundamentally underestimate the consequences for present and future generations.

Merci de nous avoir lus jusqu'au bout !










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- 1 Steve Keen provides a detailed critique of utility functions in his book [L'imposture économique](#) éditions de l'Atelier, 2014, chapter 3, p.63 ff. 
- 2 The difference between work value and utility value is well explained on the ["Introduction to economics"](#) website. It also contains information on the [utility function](#). 
- 3 Not for nothing did Nobel Prize winner Gérard Debreu publish the synthesis of the demonstration that earned him this distinction under the title *Théorie de la valeur – Analyse axiomatique de l'équilibre économique*, 1st edition 1959, 2nd edition Dunod, 1984. 
- 4 See, for example, the textbook by Paul R Krugman and Robin Wells, [Microeconomics](#) published by De Boeck, 2019. 
- 5 This is highly debatable and linked to the underlying conception of rationality (see our fact sheet on [rationality in economics](#) ). 
- 6 See Wikipedia entries on [utility](#) and [consumer theory](#). 
- 7 See [Pourquoi le " Nobel d'économie " n'est pas un prix Nobel comme les autres – Les Décodeurs, Le Monde \(09/10/2023\)](#) 
- 8 Not for nothing did Nobel Prize winner Gérard Debreu publish the synthesis of the demonstration that earned him this distinction under the title *Théorie de la valeur – Analyse axiomatique de l'équilibre économique*, 1st edition 1959, 2nd edition Dunod, 1984. 
- 9 See, for example, Valérie Clément, ["Economie du bien-être, choix social et l'influence de la Théorie de la justice"](#), *Raisons politiques*, vol. 33, n°1, 2009, pp. 57-79. 

- 10 See [Cost-benefit analysis and the environment. Theoretical advances and use by public authorities](#) OECD, 2019. (^)
- 11 See the [GDP, growth and planetary limits](#)  module. (^)
- 12 Externalities are the effects that the activity of one agent produces on other agents, without financial compensation. They can be negative (as in the case of a factory polluting a river) or positive. (^)
- 13 Which is also the basis of [ecosystem service valuation](#). (^)
- 14 From his 1960 article, "[The problem of social cost](#)", Ronald Coase "established" a theorem (stated as such by [George Stigler](#) in 1966) which can be expressed as follows: if transaction costs are zero, any initial allocation of property rights will always result in an optimal allocation of resources. Coase thus reverses the political argument that regulation is necessary to correct a misallocation of property rights. His theorem has thus been used to justify liberal policies. (^)
- 15 For the case of greenhouse gas emissions, see Philippe Quirion, [Tradable greenhouse gas emission allowances: elements of economic analysis](#) Ecole des Hautes Etudes en Sciences Sociales (EHESS), 2011. (^)
- 16 From his 1960 article, "[The problem of social cost](#)", Ronald Coase "established" a theorem (stated as such by [George Stigler](#) in 1966) which can be expressed as follows: if transaction costs are zero, any initial allocation of property rights will always result in an optimal allocation of resources. Coase thus reverses the political argument that regulation is necessary to correct a misallocation of property rights. His theorem has thus been used to justify liberal policies. (^)
- 17 In sociology, we find the same issue under the heading of "[methodological individualism](#)". (^)
- 18 See "[La nouvelle macroéconomie où comment introduire des marchés dans un monde sans échanges](#)", Autisme-économie website, December 2014. (^)

- 19 This new macroeconomics has roughly two branches: classical and “neo-Keynesian”, but in both cases the foundations are the same. 
- 20 RBC models (for *Real Business Cycles*) are based on the [model developed by Robert Solow](#). They “see” the fluctuations of the economy – its “cycles” – solely as the manifestation of the optimal adaptation of market economies to the external shocks they experience. 
- 21 DSGE, for *Dynamic Stochastic General Equilibrium*. *General Equilibrium* refers to the fact that these models are built around the choice of an agent who decides everything (consumption, production, investment, employment), for the present and the future. This choice is described as “dynamic” because it covers the agent’s entire life, and as “stochastic” because it takes place in an environment subject to unpredictable “shocks”. 
- 22 See Paul Romer, [“The Trouble with Macroeconomics”](#), September 2016; Olivier Blanchard, [“Do DGSE models have a future”](#), Policy Brief, Peterson Institute for International Economics, August 2018. 
- 23 See Bernard Guerrien, [Robinson, Maupertuis and the new macroeconomics](#), 2017. Note that work in progress seeks to model several types of agent according to their income. 
- 24 See Alain Grandjean, Gaël Giraud, [“Comparaison des modèles météorologiques, climatiques et économiques: quelles capacités, quelles limites, quels usages?”](#), Working paper, Energy and Prosperity Chair, May 2017. 
- 25 Steve Keen provides a detailed critique of utility functions in his book [L'imposture économique](#) éditions de l'Atelier, 2014, chapter 3, p.63 ff. 
- 26 See Steve Keen’s *L'imposture économique*, and the work of Bernard Guerrien. 
- 27 Read an extract from [Gaël Giraud’s interview with Mediapart](#), “Keen gets us out of a rut”, October 2014. 

- 28 See [Pourquoi le " Nobel d'économie " n'est pas un prix Nobel comme les autres](#) – Les Décodeurs, *Le Monde* (09/10/2023) 
- 29 See Alain Grandjean, "Le prix Nobel de Nordhaus n'est pas menacé: notre monde, lui, l'est." (translation of an article by Steve Keen published in English on 4/07/19 on the [Mint Magazine](#)), Chroniques de l'Anthropocène blog, September 2019; [Réchauffement climatique : quel impact sur la croissance?](#)  fact sheet, in particular ["Integrated assessment models aim to explore the entire climate-development loop"](#).  
- 30 See the Wikipedia entry on the [Ramsey model](#). 
- 31 The best known is the Cobb-Douglas function. The utility of a basket of goods, (x_1, x_2) is $U(x_1, x_2) = x_1^\alpha x_2^\beta$. This function is concave (the marginal utility of goods decreases with their number), continuous and derivable, and homogeneous of degree 1 (multiplying the number of a good by n increases the utility by this number raised to a certain power). 
- 32 In short, [Arrow's impossibility theorem](#), also known as Arrow's paradox, shows (in a formalized, albeit debatable, framework) that there is no indisputable social choice process that can express a coherent hierarchy of preferences for a community from the aggregation of individual preferences expressed by each member of that same community. 
- 33 See the Wikipedia entry on [Sonnenschein's theorem](#). 
- 34 See Andreu Mas-Colell, "Capital Theory Paradoxes: Anything Goes", in: Feiwel, G.R. (eds), *Joan Robinson and Modern Economic Theory*, Palgrave Macmillan, 1989, pp 505-520. 
- 35 See Gaël Giraud, [Paul Romer, le Nobel qui a osé révéler que "le roi de la théorie macroéconomique est nu"](#), *Le Monde*, October 16, 2018. 

- 36 Paul Romer, [“The Trouble With Macroeconomics”](#), Omicron Delta Epsilon Society, January 5, 2016. 
- 37 Steve Keen, [L'imposture économique](#) éditions de l'Atelier, 2014. 
- 38 See Gaël Giraud, [Financial Illusion](#) éditions de l'Atelier, 3rd edition, 2014. 
- 39 See [Economie critique](#), Bernard Guerrien's website. 