

Book review: Moscati, I. (2018). *Measuring utility: From the marginal revolution to behavioral economics*. Oxford Studies in History of Economics, New York, Oxford University Press.

Ivan Moscati has written a definitive treatment of the intellectual evolution of the measurement of utility from the mid-19th century to 1985. As behooves the title the story is about both utility and measurement, showing how the two co-evolved over time influencing and putting pressure on each other. Thus Moscati, on the one hand, shows how conceptions of measurement in economics evolved after the marginal revolution and how this change affected utility analysis. On the other hand, he also traces how the conceptions of measurement adopted by economists were sensitive to those in psychology.

He reconstructs these interrelationships at a very high level of detail, revealing the roles of often unacknowledged figures – from the Austrians Cuhel and Alt, to the early American experimentalists Karmakar, McCord, and de Neufville – many of whom had interesting and subtle views now smoothed over in textbooks. His sources are not only published papers and books but also, often fascinating, the letters and notes economists wrote to each other, which add flourish and colour to the demanding and technical content of the subject matter. The sheer amount of information that Moscati assembles makes the book a tremendous resource for other historians and philosophers of economics. This virtue will, we hope, make it an essential go-to reference for ongoing debates about the nature of preferences, realism versus instrumentalism in economics, the normative relevance of utility and much else. In this regard, the book is an invaluable service to the profession.

The book is divided into four chronological parts with each covering a period he identifies as relatively self-contained in the overall story.

Part I is about the utility theorists involved in the marginal revolution: Jevons, Menger, Walras, etc. Here Moscati's key message is that the usual portrayal of these economists as cardinalists is inaccurate. They were instead committed to a unit-based understanding of utility and measurement. The unit based-understanding of measurement holds that a property of some object is measurable if and only if we can compare it with some other object that exhibits the same property – the unit – and thereby obtain the ratio between the unit and the object we want to measure. This understanding describes what later the measurement theorist Stevens identified as a 'ratio scale' with a non-arbitrary zero point. This is different from cardinal utility because cardinal utility, as it is commonly understood, is only measurable on an interval scale with an arbitrary zero point. As a consequence, cardinal utility does not allow the comparison of utility ratios.

According to Moscati highlighting this difference is important for understanding the focus of the early marginalists on utility-ratios instead of utility differences. Moreover, it also helps us to appreciate why it was difficult for the marginalists to reconcile their unit-based understanding of measurement, which requires assigning utility ratios in order to be able to measure utility, with their scientific practices in which they were unable to come up with a unit for assessing utility ratios. No matter the different ways of conceiving of the utile (as pleasures for Jevons, or needs for Menger), they failed to establish a procedure for measuring it and this led many of the early marginalists to a sceptical conclusion regarding the possibility of utility measurement. Still, they insisted that the fact that utility is not (yet) measurable should not prevent it from becoming a central notion in economics. Consequently, Moscati thinks that the cardinal-ordinal distinction familiar from contemporary textbooks is too unrefined to reflect the history of utility theory.

Especially interesting for philosophers of economics will be the details of the distinct positions on the nature of utility taken by different marginalists. While most of them (e.g. Jevons, Edgeworth, Menger) were, what is now called, mentalists, Walras advocated what is now called, instrumentalism. Within mentalism there were significant rifts, for example, Fisher defined utility as a relatively abstract mental concept and criticised Edgeworth and Jevons for unnecessarily introducing psychological ideas into economics. These are familiar issues today and it is valuable to be reminded of their long history.

Part II focuses on the period 1900-1945. During this time ordinal utility and the idea that preferences are the primary notion of demand and utility analysis became dominant. This was due first and foremost to the work of Pareto, who showed that the results of demand and equilibrium analysis are independent of a unit-based understanding of utility. So, the problems caused by the unit-based understanding of utility could be avoided. Yet, at the same time, due to the work of Lange, Allen and Alt and others, a new understanding of what it would mean to measure utility emerged. It became common to hold that in order to have measurable utility one needs to have utility that is unique up to positive linear transformations and can, therefore, be represented on an interval-scale. Paul Samuelson's 1938 article "The numerical representation of ordered classifications and the concept of utility" associated this type of utility with the notion of cardinal utility. Within a few years, this became standard terminology in economics. Moscati points out that it is at this point in history that cardinal utility enters the debate and not, as usually portrayed, with the early marginalists. It also became clear that cardinal utility (rather than unit-based utility) is sufficient for analysing diminishing marginal utility and for thinking about intertemporal choice. Therefore, it became evident that the question of whether we can obtain cardinal utility is more relevant to economics than whether we can obtain unit-based utility. According to Moscati, this fact has led many historians of economics to mistakenly project a concern for cardinal utility back to the early marginalists, while they were in fact concerned with unit-based utility.

Much of the debate at that time was focused on which abilities of agents would be sufficient to arrive at cardinal utility (for example, the ability to compare differences or transitions in utilities). Yet, most participants in these debates, notably Hicks and Samuelson, concluded that cardinal utility is not obtainable. Moscati emphasizes that while cardinal utility became seen as sufficient for measurement, this did not involve an explicit redefinition of “the very concept of measurement” (p. 130) and a unit-based understanding of measurement continued to be dominant in economics and other sciences. The outcome of all of this was that most economists remained skeptical about the measurability of utility. As a result, the efforts both of Frisch in econometrics and of Thurstone in psychology to measure utility remained virtually ignored or else rejected by economists.

This part of the book depicts the dominance of ordinal utility in the first half of the 20th century in an astonishing amount of detail with a fascinating cast of characters and their subtle theoretical proposals. For example, Moscati shows Pareto and Samuelson being mentalists about preferences, even though they are usually presented as early proponents of an instrumentalist or antirealist stance in economics.

Part III of the book focuses on how Morgenstern and von Neumann resurrected cardinal utility by developing their version of expected utility theory (EUT). While the outlines of this story are familiar, Moscati’s rendition is distinctive and interesting. It lifts the veil on the complex differences between von Neumann’s and Morgenstern’s motivations and uncovers textual evidence that the two in fact pursued different aims, with von Neumann caring only about the theorem, while Morgenstern sought to give it an interpretation meaningful to economists. Equally newsworthy is the fact that EUT remained deeply controversial well into the 1950s. The key disagreement was about the relationship between  $u$  (i.e. the utility function as it figures in EUT) and  $U$  (i.e. the traditional utility function usually assumed to be ordinal). Initially Savage and Friedman held that the two are equivalent. Yet, Baumol argued that the curvature of  $U$  is not invariant to monotonic increasing transformations. Therefore, one could change the risk attitudes of the agent simply by using a different function to represent the agent’s utility. In his response to Baumol, Friedman developed the view that  $u$  in EUT and the traditional utility function  $U$  are two different functions that should not be conflated. While he agreed that  $U$  is an ordinal function, he argued that this does not prevent  $u$  from being cardinal. Moreover, the exchange with Baumol also changed Friedman’s understanding of  $u$  from a causally interpreted function to a mere means for predicting choice behavior. If  $u$  and  $U$  are not equivalent, then, according to Friedman, the best interpretation of these functions is to understand them in an instrumentalist way.

Moscati highlights that Friedman’s famous as-if methodology was influenced by his views on the relationship between  $u$  and  $U$  utility and his debate with Baumol. Partly due to the spread of instrumentalist ideas in economics in the 1950s, championed by Friedman, Savage, Alchian, and Ellsberg, a new understanding of measurement emerged. According

to it, measurement is largely conventional and consists in the assignment of numbers to objects according to a definite set of operations. Such measurement is valid if it allows the prediction of choice-behavior. This line of reasoning finally led to the abandonment of the unit-based understanding of measurement that had dominated economics since the marginal revolution. (Interestingly it also got abandoned in psychology under the influence of Stevens's operationalism, but, according to Moscati, for entirely independent reasons). Furthermore, understanding  $U$  and  $u$  as different functions also enabled the peaceful coexistence of cardinal and ordinal utility in economic theory.

With a new conception of measurement and a hard-won consensus on EUT (Samuelson and Baumol were the last hold-outs, but Savage's many letters won them over), the Americans headed to Paris to a 1952 conference organized by Maurice Allais. The French economists, especially Allais, strongly resisted the claims by the Americans that EUT is descriptively and normatively compelling. The Americans presented a unified front, but in fact they endorsed EUT for different reasons. Savage and Samuelson accepted the theory due to its normative appeal, while Friedman accepted it because it was for him a good means of predicting choice behavior.

Part IV depicts the initial brief optimism about the possibility of measuring utility on the basis of EUT and then a growing disappointment turning into skepticism. Attempts to measure utility in the 1950s – the Mosteller-Nogee experiment and the Davidson-Suppes-Siegel experiment – led to the view that experimental results were generally consistent with EUT. These experiments also aimed at assessing the curvature of the utility function  $u$ , while the later experiments conducted by Marschak and Dolbear in the 1960s aimed only at testing the theory. Moscati argues that the “shape questions” lost their relevance as earlier experiments had shown no single  $u$  shape. Moreover, the experimenters of the 1950s were not economists and not aware of the consensus within economics that  $u$  is not equivalent to  $U$ . Yet, Marschak and Dolbear clearly understood  $U$  and  $u$  as two different functions. Consequently, they did not interpret  $u$  as representing the utility of riskless money but just as an index that can be used to predict choice behavior under risk, which made them less interested in the precise shape of the function.

At this point in the book, Moscati takes a detour showing how issues related to utility measurement prompted Patrick Suppes and his co-authors to develop their representational theory of measurement. The first volume of *Foundations of Measurement* was published in 1971 and had a significant impact on conceptions of measurement in the social sciences.

Moscati ends this final part of the book by outlining how experiments conducted between 1965 and 1985 undermined the validity of EUT. On top of this, the multiplicity of EUT-based utility measures made it questionable which of them should be used (e.g. Probability Equivalence vs. Certainty Equivalence). That such supposedly irrelevant modifications of the measurement method could hugely alter the outcome, made it

harder to adhere to the operationalist understanding of measurement by then dominant in economics.

The end of the story is largely negative with EUT buckling under pressure from the rising behavioral and experimental economics starting around the 1970s. The story ends in 1985 because Moscati takes this date to inaugurate a new era. Three new conceptions of utility emerge and bring with them new methods of measurement: utility within non-EUT models (such as rank-dependent utility models), remembered/experienced utility (sometimes known as happiness), and neurological correlates of subjective value.

As is perhaps already becoming clear the strengths of Moscati's book are twofold: the level of detail that recovers the richness and diversity of this side of economics before this richness got erased by textbooks, and the telling of the story of utility alongside the story of measurement. What about its weaknesses?

Our main worry is whether the book delivers these goods without providing an explanatory narrative as a history should. Although 'story' and 'narrative' are terms repeatedly used by Moscati to characterize what he is doing, we doubt that other historians of science would see the book as such. Even granting many ways of writing history, historians working in different traditions would normally distinguish between histories and chronicles. This distinction is useful for appreciating the value of this book and for approaching it with the right expectations.

A history provides a narrative explanation of why things happened the way they did. Histories of science can do so in different ways. They can reconstruct the social and cultural context of a knowledge making practice, contextualize the communities and events within their milieus and show how different scientific practices connect with each other and the rest of their environment. Or they could explicate the epistemic aims and virtues that influenced the development of research programmes and, thereby, provide us with a rationalization of their development. Or they could do both. (The options above follow the distinction between external and internal histories of science, which we grant is problematic, but is nevertheless a helpful here). Either way histories offer explanatory narratives that hang together.

A chronicle, on the other hand, just says what happened: who said and did what, and in what order. In particular, chronicles of science may say who thought what, how they justified it to others, and what was argued as a result or in response to these thoughts. Chronicles are hard work to produce and we should never look down on them. They are also tremendously valuable to many audiences. They even enable the writing of histories, but they are not histories.

To be clear, Moscati's book is far more than a chronicle: he tells us where each scientist worked and studied, who their teacher was, how they justified their views of utility and

measurement to others, and how they built on existing views. But his goal is more of a description of intellectual claims than an explanation of how this knowledge was produced. For example, there is no contextualization of the project of utility measurement within the larger context of the nineteenth and twentieth century sciences. There is no acknowledgement at all of the very idea that measurement and utility might have a social as well as an intellectual history. In the Introduction, when Moscati articulates what his book does not do (for example, it does not cover social welfare, nor the revealed preference approaches), a social history of utility is so invisible that it is not even on that list. Our worry is not that any history of utility has to be a social one, but rather that a historian of utility should acknowledge that there might be one. After all both concepts, utility and measurement, were indispensable to the political and economic systems in which they were born and developed. So, there is every reason for a historian to attend to the roles of industrialisation, the rise of bureaucratic governance, quantification, standardisation, etc. If Moscati took these concerns seriously he might have considered the role of the universalizing impulse of imperial sciences in the rise of the concept of utility in nineteenth century. Or he might have asked whether the geopolitics of the Cold War had something to do with the dominance of the American-born EUT. Or whether its eventual collapse in the 1970s and 1980s is an instance of a larger trend of decline of mechanistic conceptions of rationality with the rise of counterculture.

Moreover, Moscati does not offer an evaluation of various important turns in the history of utility analysis as an internal history would do. Does he understand the turn away from unit-based utility to ordinal utility as a justified move? Would he take Pareto to be warranted in holding that each science progresses by finding its own fundamental laws and that economics “has therefore a great interest in relying as little as possible on the domain of psychology”? If so, economics should take the abstract mental concept of preferences as a point of departure. Or, does Moscati view this turn simply as resulting from the failure of finding a unit for utility? Similarly, does he conceive of Friedman’s as-if methodology as an ad hoc move to shield his work from Baumol’s criticisms or as a sound methodological proposal? And finally, what exactly is the relation between the normative and descriptive justifications of EUT? Moscati merely lists these justifications. Yet, an internal history of science would have explained whether they support or preclude each other (e.g. because the normative justifications require a realist interpretation of  $u$ , while the descriptive ones may be strongest under instrumentalism). An internal history might also ask whether, given the negative picture of EUT Moscati draws at the end, the only reason it still remains dominant in many parts of economics is that there is no better alternative yet. Or, are there genuine normative virtues of the theory that make it hard to replace? Moreover, in the face of the important role of EUT for the development of Friedman’s as-if methodology, how far does the fate of instrumentalism in economics depend on EUT?

The commitment to record facts rather than to reimagine them means that the book is a good foil for raising questions, but it makes few moves to answer them.

Another chronicle-like feature of the book is that the story sometimes flows and sometimes doesn't. The account of Suppes's representational theory of measurement sticks out in Part IV in a way that's not clearly linked to the rest of the EUT. For the purposes of a chronicle it should, of course, be there, but its historical significance is not brought out. The place of prospect theory is similarly confusing: Moscati does not discuss its rise in the 1980s because the book is on utility measurement rather than on the history of choice theories, but the Allais Paradox, which is first and foremost a counterexample to EUT, gets a thorough treatment.

It is similarly difficult to understand Moscati's decisions about what to exclude from his account. He explicitly brackets the revealed preference approach because most of the early literature on it only deals with the theoretical problem of how to derive various restrictions on demand functions from other restrictions on demand functions. But why exclude it altogether? Could it not be argued that the very project of measuring utility by observing choices of, say, lotteries, is fundamentally committed to a behaviorist methodology associated with the revealed preference theory? Of course, some proponents of this influential tradition would not identify what they are doing as utility measurement because they view preferences as identical with choice and utility functions simply as a handy tool for representing choices. Nonetheless, it is plausible to classify what they are doing as measurement under the instrumentalist view of measurement as the assignment of numbers to objects. Since revealed preference theory is so central to how many present-day economists view their discipline and to cost-benefit analysis as a method of social evaluation, which is also, on the face of it, a utility measurement project, a deeper justification for excluding it altogether is needed.

We end with an observation about the intended audience of this book. We fear that historians of science, who nowadays share a deep commitment to understanding science in the full richness of its context, are not it. Perhaps instead the audiences Moscati intended are economists who want to see detailed reconstructions of the ideas of their predecessors, and philosophers of economics who are typically happier to dwell in the world of decontextualized concepts of utility, preferences, etc. But the absence of unifying narrative in the book should not deter readers: Moscati has reconstructed and lined up a rich collection of facts, corrected many common misperceptions, and shown connections that were hitherto hidden. These goods will serve many audiences well: those seeking a historically informed variety of options for theorizing utility and those who in the future will write histories of it. Whatever your purpose, Moscati's book is now an obligatory reference point.

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