

MENGER, JEVONS AND WALRAS DE-HOMOGENIZED

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In this essay, emphasis is laid on the differences between the “revolutionary” innovations of Menger, Jevons and Walras. The main point is that the persistent historiographic practice of classifying these authors together simply as independent discoverers of very much the same marginal utility principle has obscured essential differences not only in the original intent and design of their theoretical edifices, but also in the influence their major works exerted, each in a way of its own, upon the subsequent development of economic thought.

This is intended as an essay in historiography — to illustrate how the widely disseminated practice of lumping Menger, Jevons and Walras together under one caption has grossly distorted the history of their contributions to economic analysis. The usual caption is, of course, “The Marginal Revolution of the 1870s,” a subject amply treated elsewhere.¹ The question I propose to raise here is not whether there ever was a “Marginal Revolution” in the proper sense of the term, but whether the use of any single appellation to designate the three “revolutionary” innovations of the 1870s obscures precisely those differences between them which the passage of time has revealed more important than anything they may have had in common.

Exactly when and where the name “Marginal Revolution” made its first appearance I do not know. For present purposes it suffices to take Schumpeter’s *History of Economic Analysis* of 1954 as the starting point, for in that treatise the name was not merely used as a tag, but was discussed from the standpoint of its appropriateness.² Already in 1953, T. W. Hutchison had written apropos of Gossen and Jevons, “The playing up or playing down of the revolutionary newness of a writer’s

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1. Black *et al.* (1973): the papers in this collection having appeared both in the *History of Political Economy*, Fall 1972, 4, pp. 266-624, and in a separately published bound volume with a useful index added, the page references in the following notes to Black *et al.*, (1973) will be to the volume with corresponding pages in the journal placed immediately after in square brackets.

2. Schumpeter (1954, pp. 909-920).

contribution is, of course, often largely a matter of temperament and intellectual vested interest.”³ Mark Blaug boldly headed Chapter 8 of his *Economic Theory in Retrospect* of 1962, “The Marginal Revolution,” but added the caution, “To speak of a marginal *revolution* is in itself somewhat misleading.”⁴ And Lord Robbins in 1970 approached the term “Marginal Revolution” with characteristic reserve, admitting on the one hand, that “it became the starting point and the stimulus for much of the theoretical development since its day,” while protesting, on the other hand, that “some of the innovators went much too far in regarding [their new discovery] as a substitute for Classical theory rather than as a valuable extension.”⁵ None of these historians of economics ever so much as hinted that there might be a question whether the contributions of Menger, Jevons and Walras were sufficiently akin to justify referring to them by the same family name and bringing them under one heading. No heed was paid to J. R. Hicks’ admonition, conveyed timely enough in 1934, “But anyone who comes a little closer to these writers [Menger, Jevons and Walras] cannot help feeling a little resentment at the habit of classifying them together, even for the joint receipt of such an honourable title [as independent discoverers of the Marginal Utility principle].”⁶

The stress laid by historians of economics on the marginal utility tool as constituting the essential feature of the triple discoveries is in accord with Schumpeter’s definition of science as “tooled knowledge.”⁷ This definition in the hands of historians of economics who construe it altogether too narrowly has tended to divert attention from the desired knowledge to the tools used in giving formal structure to the knowledge. That knowledge-structures are more important than the tools used in erecting them is seen in the fact that the theoretical edifices raised by Menger, Jevons and Walras, albeit with closely similar variants of the same tool, were markedly different and influenced the future course of theoretical model building in fundamentally different ways, the tool itself having in the meantime become obsolete.

Schumpeter himself called attention to the most important difference of all in the work of the three “revolutionaries,” when he singled out Walras from the others as the sole architect of the general equilibrium structure. “This,” he wrote, “was the achievement of Walras. So soon as

3. Hutchison (1953, p. 15).

4. Blaug (1968, p. 298).

5. Robbins (1970, p. 16).

6. Hicks (1934, p. 338). It was none other than Léon Walras who set the example in 1889 of classifying Jevons, Menger and himself together as co-discoverers of the modern marginal utility theory. See Walras (1874/..., 2nd edition 1889: pp. VIII-IX and § 160, corresponding to pp. VI-VII and §§ 162-164 of the definitive edition and to pp. 36-37 and 204-207 of the English translation).

7. Schumpeter (1954, p. 7).

we realize that it is the general equilibrium system which is the really important thing, we discover that, in itself, the principle of marginal utility is not so important after all as Jevons, the Austrians, and Walras himself believed.”⁸ True, but when Schumpeter went on to say that “analysis of Walras’s schema discloses the fact that marginal utility was the ladder by which Walras climbed to the level of his general equilibrium system,” he drew an inference which, though plausible enough *a priori*, is contradicted by documentary evidence brought to light since Schumpeter’s day.

Instead of climbing up from marginal utility to the level of his general equilibrium system, Walras actually climbed down from that level to marginal utility. This is abundantly attested by Walras’s manuscript essays to which he privately confided his early analytical lucubrations⁹ from 1860 until he ventured upon a full-dress public presentation of his “Principe d’une théorie mathématique de l’échange” before the Académie des sciences morales et politiques in Paris on the 16th and 23rd of August, 1873.¹⁰ In this paper, after more than twelve years of unpublished efforts to piece together an analytical schema of interrelated competitive markets without ever once alluding to anything like a marginal utility theory, Walras suddenly brought forth, as fully accoutered as Pallas Athena from the head of Zeus, his new idea of *rareté*, which he defined mathematically as we do marginal utility. With the aid of this conceptual device Walras proceeded in the same paper to demonstrate the relation of his *rareté* (marginal utility) functions to individual demand functions in order to establish a logically “causal” link between *rareté* and value in exchange. All this is found toward the end of the “Principe d’une théorie mathématique de l’échange,” the beginning of which is taken up with a theory of the competitive market mechanism for grinding out equilibrium relative prices in the simple two-commodity case.

The order of exposition followed in this article recapitulated exactly the order in which Léon Walras had arrived at his ideas. Evidence I have adduced elsewhere¹¹ shows that Walras did not come into possession of his concept of marginal utility and his method of using it to derive a theoretical demand curve until after he had clearly outlined his mathematical theory of a network of interrelated markets.¹² For that the

8. *Ibid.*, p. 918; italics added.

9. Jaffe (1965), cited hereafter as *Correspondence*, vol. I, pp. 216-221, n. (33) to Letter 148.

10. Walras (1874/1883).

11. Black *et al.*, (1973, pp. 113-139 [379-405], especially pp. 127-132 [392-398]).

12. Toward the end of his life Walras described the sequence of his early progress in discovery as follows: “. . . en Octobre 1871, au moment où je devenais professeur ordinaire, je tenais enfin la première des deux clefs de l’économie politique pure telle que je voulais la faire dans sa forme rigoureusement scientifique qui est la forme mathématique: savoir ‘l’équation d’échange.’ Et dans le courant de 1872, je trouvais la seconde: savoir ‘l’équation de satisfaction maximum’ que Jevons, je le sus bientôt, venait de trouver de son côté en Angleterre” [Walras (1909, p. 581)].

writings of Turgot, Quesnay, Adam Smith, Ricardo and J. B. Say had been his inspiration; and for the translation of the vision of general market equilibrium thus obtained into mathematical equations he found models in the works of A. N. Isnard,¹³ Augustin Cournot¹⁴ and Louis Poinso.¹⁵ From Isnard's *Traité des richesses* (1781), Léon Walras derived some of the main structural features of his theory of market exchange as well as suggestions for his theory of money and capital formation, though Isnard's mathematics took the form of running proportions rather than simultaneous equations.¹⁶ From Cournot's *Recherches sur les principes mathématiques de la théorie des richesses* (1838), he learned to apply the technique of functional analysis to economics.¹⁷ And in Poinso's *Eléments de statique* (8th ed., 1842), which was a textbook on the theory of mechanics bristling with systems of simultaneous equations to represent, among other things, the mechanical equilibrium of the solar system, Léon Walras found a pattern for representing the catallactic equilibrium of the market system.¹⁸

None of these sources of early inspiration, however, offered the slightest clue to a marginal utility theory of value or, indeed, to the need for such a theory to which Léon Walras was awakened, as will be seen below, by his father, Auguste Walras. As late as January 1872, when Léon Walras was called upon to draft an outline for a series of lectures to be delivered in Geneva, he was able to sketch a pure theory of interconnected markets though he still had no notion of how to relate utility to demand.¹⁹ The best he could do at that stage was to identify the utility curve with the market (!) demand curve in the manner of Dupuit²⁰ and then take the slope of the same demand curve as an index of what he called "utilité d'intensité," the very term he later used in § 74 of *Eléments* to describe marginal utility proper. So long as he had nothing but this paltry technical apparatus at his disposal, he wisely concluded that it was impossible to elucidate further the relationship between "absolute value" and demand, especially since the intensive dimension of utility seemed unmeasurable. That, indeed, was the state of confusion in which he found himself in trying to cope with the problem of utility and value until his

13. Isnard (1781).

14. Cournot (1838/...).

15. Poinso (1842).

16. See Jaffe (1969).

17. Walras (1874/..., Preface to the 4th edition, p. VIII; p. 37 of the English translation).

18. *Correspondence*, vol. III, pp. 149-150, n. (7) to Letter 1483.

19. *Ibid.*, vol. I, pp. 293-296, n. (2) to Letter 198.

20. Five years later, in §370 of the second instalment (1877) of the first edition of the *Eléments*, Walras severely criticized Dupuit for having perpetrated the same identification to which he had himself previously subscribed. Cf. Walras (1874/..., §387 of the definitive edition).

colleague, Paul Piccard, a professor of mechanics at Lausanne, came to his rescue toward the end of 1872 by showing him how to construe utility and its derivative with respect to quantity mathematically and how to apply the equi-marginal rule to the theory of value in exchange.²¹

The trail that led Léon Walras finally to seek the help of Paul Piccard had been blazed at the start by his economist-father. Auguste Walras had wanted to prove that *rareté*, in the ordinary sense of scarcity, was "the cause of value," but ran into a snag.²² The nearest he came to a definition of scarcity was to define it as a disproportion between the aggregate quantity of a good available and the sum total, over all individuals, of wants for the good. He himself eventually realized that this definition would not do, because one of the terms of the disproportion, the sum total of wants felt by a multitude of persons of diverse tastes, conditions and means, did not admit of quantification even in principle. He then bequeathed the unsolved problem to his son, Léon.

Léon Walras was eager to solve the problem, not only out of filial piety, but because the conceptual machine he had already designed for the determination of equilibrium prices needed a motor to run it. What was lacking was something like Adam Smith's coupled motors made up of "a certain propensity in human nature . . . to truck, barter and exchange" and a universal "desire of bettering our condition." With Paul Piccard's technical assistance, Léon Walras solved at one stroke both his father's problem of finding a cogent analytical definition for *rareté* and his problem of attaching a maximization motor to his all-comprehensive market machine.

It cannot be emphasized enough that what Léon Walras was after was the completion of his competitive market model, and *not* the elaboration of a theory of subjective valuation in consumption. In the paper he presented to the Académie des sciences morales et politiques in 1873 he defined his newly discovered *rareté* as "l'intensité du dernier besoin satisfait par une *quantité possédée*" ("the intensity of the last want satisfied by a *quantity possessed*" [Walras's italics]), not a quantity consumed. Only in postulating diminishing marginal utility, did he allow the word "consumed" to slip in, inadvertently as it were. When in his later writings he occasionally used the expression "*quantité consommée*," he gave no indication that he meant by this anything else than "*quantité possédée*." It is as if he thought that the economist, *qua* economist interested in market behavior, had no more competence to derive utility functions from consumers' sensations than he had to derive these sensations from

21. *Correspondence*, vol. I, pp. 308-311, n. (4) to Letter 211.

22. See Black *et al.*, (1973, pp. 122-123 [388-389]).

their presumed physiological, psychological and sociological determinants.²³ However that may be, his inattention to consumption can be confidently attributed to the fact that his gaze was fixed on the market place, and nowhere else. His pure theory was a catallactic "theory of the determination of prices under a hypothetical regime of perfectly free competition"; and it was strictly in that context that Walras invoked marginal utility.

What a far cry this was from the central concerns of Jevons or Menger. It is true that both Jevons and Menger, each in his own way, had caught glimpses of this or that salient aspect of general equilibrium analysis but never of the whole. Menger, in his theory of imputation²⁴ for example, had meditated deeply upon the same problem that Walras later treated with mathematical firmness and generality in his "Theorem of Maximum Utility of New Capital Goods Yielding Productive Services," as it appeared in the fourth (1900) and posthumously published definitive (1926) editions of the *Eléments*.²⁵ To Jevons we are indebted for a substantial mathematical argument functionally relating what we now call marginal productivity to marginal utility in Chapter V of his *Theory of Political Economy*, thereby broaching, if not solving, a significant general equilibrium problem. Jevons's "Preface to the Second Edition" of his *Theory* abounds in reflections of a general equilibrium character, but as he himself acknowledged in the same Preface, "Looking forward to the eventual results of the theory, I must beg the reader to bear in mind that this book was never put forward as containing a systematic view of economics."²⁶

Premonitions of the whole, intuitive insights into the parts, programs for future investigation of general equilibrium are not enough. It remained for Léon Walras alone among his "co-revolutionaries" of the 1870s to receive from his contemporaries, in a Jubilee Celebration at the end of his career, the honor of being proclaimed the first to have "established the general conditions of equilibrium."²⁷ And surely it is for

23. Cf. Mill (1844/1948, p. 132, n. *), where J. S. Mill contended "that Political Economy . . . has nothing to do with the consumption of wealth, further than as the consideration of it is inseparable from that of production, or from that of distribution. We know not any of the laws of the consumption of wealth as the subject of a distinct science: they can be no other than the laws of human enjoyment. Political economists have never treated of consumption on its own account, but always for the purpose of the inquiry in what manner different kinds of consumption affect the production and distribution of wealth." I am indebted to Professor John Menefee of California State College, Bakersfield, whose unpublished working paper, "The Evolution of the Concept of Leisure in Economic Doctrines" called my attention to this passage.

24. Menger (1871/..., pp. 67-70 and 123-126; pp. 106-109 and 149-152 of the English translation).

25. Walras (1874/...), Lesson 27 of the 4th and definitive editions. Cf. second edition, §§259-261.

26. Jevons (1871/..., pp. XLIII-XLIV of the 4th edition; p. 67 of the Pelican edition, where the Preface to the Second Edition is reprinted).

27. *Correspondence*, vol. III, pp. 366-367, n. 5 to Letter 1696.

that reason and for the role he assigned in his grand system to marginal utility, rather than for the now outmoded theory of marginal utility itself, that he is still honored or berated (as in Cambridge, England) by the foremost theorists of our day.

Jevons's accomplishment, though its impact on subsequent theory was not destined to be anything like as profound or far-reaching as that of Walras, was considerable. Certainly his "final degree of utility" is formally and analytically identical with Léon Walras's *rareté*. Like Walras after him, Jevons looked upon his differential coefficient as a lethal weapon with which to strike down forever the classical theory of value. Moreover, Jevons anticipated Walras in formulating the following two fundamental propositions: (1) that "*the ratio of exchange of any two commodities will be the reciprocal of the ratios of the final degrees of utility of the quantities of commodity available after the exchange is completed*,"²⁸ a proposition which Jevons called the "keystone of the whole Theory of Exchange"; and (2) "that a person distributes his income in such a way as to equalize the utility of the final increments of all commodities consumed"²⁹ — Gossen's "second law," as he later learned.³⁰ When these propositions are reduced to symbolic form, they are found to have easily recognizable, but more precisely stated, counterparts in Walras.

There is, however, an important difference. In Walras, the theorem of proportionality of *raretés* to parametric market prices was used to derive individual demand and offer functions which, when aggregated over all individuals, served to determine equilibrium prices in a pre-specified perfectly competitive market system. In Jevons, *per contra*, there is no analysis of the operations of the market mechanism by which his "consequent ratio of exchange" is arrived at. Jevons contented himself with describing his perfect market in quasi-institutional terms as a market in which "there must be no conspiracies for absorbing and holding supplies to produce unnatural ratios of exchange," and in which the "law of indifference" is in force, thus precluding effective transactions at other than equilibrium prices by virtue of a full and instantaneous publication (compulsory, if necessary) of: (1) the stocks of commodities available, (2) the "intentions of exchanging" (i.e., the individual demand and offer schedules) of all the dealers and (3) "the ratio of exchange [agreed upon] between any two persons."³¹ It is, to be sure, a perfect

28. Jevons (1871/ . . . , p. 95 of the 4th edition; p. 139 of the Pelican edition; Jevons's italics).

29. *Ibid.*, p. 140 of the 4th edition; p. 170 of the Pelican edition.

30. *Ibid.*, p. XXXIV of the 4th edition; p. 61 of the Pelican edition.

31. *Ibid.*, pp. 85-88 of the 4th edition; pp. 132-133 of the Pelican edition. Though Léon Walras had less to say on the subject, he too saw the competitive market in a quasi-institutional light. He remarked in 1909 that he had assumed for his theoretical model "un régime hypothétique de *libre concurrence organisée* (ce qui est tout autre chose que le simple *laisser-faire*)" [Walras (1909), p. 581; Walras's italics]. Thus free competition in Walras's model was not spontaneous in origin, but something that had to be consciously *organized*.

market not unlike that of Walras, but it is not one that could be seen to give rise to multiple equilibrium prices or, indeed, to any equilibrium price at all. Jevons, moreover, did not take systematically into consideration the interactions within a commercially interconnected network of markets.

Walras, while conceding Jevons's priority in the matter of marginal utility, was therefore justified in pointing out to Jevons: (1) that Jevons's ratio of exchange was nothing but a posited ruling price; (2) that Jevons had failed to derive "the equation of *effective demand* as a function of *price*, which could have been so easily deduced [from the 'final degree of utility function'] and which is so indispensable for the solution of the problem of the determination of equilibrium price;"³² and (3) that Jevons had not produced "the theorem of general equilibrium and its corollary, viz. the laws of the emergence and variation of equilibrium prices."³³ In his Introduction to the Pelican edition of Jevons's *Theory of Political Economy*, R. D. Collison Black admitted that "Jevons's treatment of these matters cannot be regarded as satisfactory,"³⁴ and remarked elsewhere that Jevons's "economics would have been better . . . if he had dealt simply with the 'laws of demand' instead of trying to determine the 'laws of utility.'"³⁵

Not only was Jevons's approach entirely different from that of Walras, but his point of departure also. Jevons started out from Bentham's felicific calculus;³⁶ I don't believe I have seen Bentham's name mentioned once in all of Walras's writings, published or unpublished, which is not surprising since he had always exhibited a strong antipathy to "utilitarisme."³⁷ Jevons focused his attention from the beginning on what Edgeworth called "Hedonometry"³⁸ and bestowed concentrated effort on an attempt to reduce utilitarian speculations to an exact science which would be useful as a foundation for the theory of value in exchange; while Walras peremptorily and nonchalantly — too nonchalantly some would say³⁹ — postulated a measurable marginal utility theory without more ado, for the sole purpose of rounding out his previously formulated catallactic theory of price determination.

Carl Menger clearly stands apart from the other two reputed founders

32. *Correspondence*, vol. I, p. 397, Letter 275; my translation.

33. *Ibid.*, vol. I, p. 414, Letter 286; my translation.

34. *Op. cit.*, p. 21.

35. Black *et al.*, (1973, p. 108 [p. 374]).

36. Black (1972, pp. 122-127).

37. Walras (1896/1936, pp. 194-196 in both editions); and Walras (1898/1936, pp. 457-459 in both editions).

38. Edgeworth (1881, pp. 98-102).

39. Georgescu-Roegen (1966, p. 18).

of the modern marginal utility theory. Menger, of course, deserves to be celebrated no less than his two famous contemporaries as the discoverer of a method of incorporating utility and scarcity into a novel, pathbreaking explanation of value. In fact, so impressive was Menger's performance that Stigler judges Menger's theory "greatly superior to that of Jevons"⁴⁰ and Georgescu-Roegen deplores the placing of Menger "by almost every historian on a lower level than either Walras or Jevons."⁴¹ Von Hayek goes so far as to hold that Menger's *Grundsätze der Volkswirtschaftslehre* "provided a much more thorough account of the relations between utility, value and price, than is found in any of the works of Jevons and Walras."⁴² No one familiar with the primary literature can doubt for a moment that Menger's treatment of the structure of wants in relation to *evaluation* was more profound and more penetrating not only than that of Walras who evinced no particular interest in such questions, but also than that of Jevons to whom the theory was, however, conceived on the analogy of a mechanical balance of physical forces, whereas Menger's theory was adorned with only one mechanical metaphor and that in the course of an argument purporting to prove that it is a mistake to regard "the magnitude of price as the essential feature of exchange."⁴³

According to Menger, this "mistake" leads to "the further error of regarding the quantities of goods in an exchange as *equivalents*." Menger argued that quantities exchanged could only be *equivalents* "in the objective sense" if, *ceteris paribus*, exchanges were reversible; but since "experience tells us that in a case of this kind neither of the two participants would give his consent to such an arrangement [reversing the transaction]," equality of the values of two quantities of goods (an equality in the objective sense) nowhere has any real existence."⁴⁴ As Georgescu-Roegen has observed, "Menger's theory cannot explain prices."⁴⁵

Menger, however, did not mean to explain prices. If such an explanation had been his aim, surely he would have attempted to forge an analytical link between the "importance of satisfactions" and market prices. This he did not do. In his discussion of isolated two-party barter Menger never referred to rates of exchange while demonstrating the relation between given scales of "Bedürfnissbefriedigungen" and the quantities of horses and cows traded.⁴⁶ When he finally worked up to

40. Stigler (1941, p. 135).

41. Georgescu-Roegen (1966, p. 19).

42. Hayek (1968, p. 125).

43. Menger (1871/..., pp. 172-173; p. 192 of the English translation).

44. *Ibid.*, pp. 173-175, passages quoted from pp. 192-194 of the English translation.

45. Georgescu-Roegen (1968, p. 251).

46. Menger (1871/..., pp. 163-167; pp. 183-187 of the English translation).

the case of "beiderseitiger Concurrenz," the connection between his scales of importance of want satisfactions and price formation found no place.⁴⁷ Why should it, if market price is merely a superficial and incidental manifestation of much deeper forces at work in the exchange of goods and services?

The anomalous role of Menger in the "Marginal Revolution" was recently brought into high relief by Erich Streissler's question, "To What Extent was the Austrian School Marginalist?"⁴⁸ How could anyone ask such a question when everyone thinks of Carl Menger as one of the founding fathers, if not *the* founding father, of modern marginalism? Streissler, however, had good reason to raise this question, in view of the fact that Menger nowhere concerned himself with relative maximum or minimum values of a function, which Streissler rightly sees as embodying the essence of marginalism.⁴⁹ The issue does not hinge on Menger's eschewal of mathematics, for Menger could just as well have formulated a proper marginalist theory "in sentences of the common language,"⁵⁰ without any loss of precision, had he been so minded. But Menger kept too close to the real world for either the verbal or the symbolic formulation of the theory; and in the real world he saw no sharply defined points of equilibrium, but rather bounded indeterminacies not only in isolated bilateral barter but also in competitive market trading. To quote Streissler, "His [Menger's] economics in its substantive content was disequilibrium economics;"⁵¹ it was also in a broad sense institutional economics.

It is not that Menger was unaware of tendencies to eventual equilibrium in the real world, but he was too conscious of the ubiquitous obstacles that, even *ceteris paribus*, impede the attainment of market equilibrium within anything less than secular delays. With his attention unswervingly fixed on reality, Menger could not, and did not, abstract from the difficulties traders face in any attempt to obtain all the information required for anything like a pinpoint equilibrium determination of market prices to emerge, nor did his approach permit him to abstract from the uncertainties that veil the future, even the near future in the conscious anticipation of which most present transactions take place. Neither did he exclude the existence of non-competing groups, or the omni-presence of monopolistic or monopoloid traders in the market.

47. *Ibid.*, pp. 175-179 and 201-206; pp. 194-197 and 216-220 of the English translation. Cf. Black *et al.*, (1973, p. 120 [386]).

48. Black *et al.*, (1973, p. 160 [426]).

49. As G. L. S. Shackle expressed it, "... marginalism is (if I may be allowed to invent yet another word) simply maximalism or minimalism, when those are conceived in the formal mathematical sense" [Black *et al.* (1973, p. 325 [591])].

50. Hicks and Weber, (1973, p. 38).

51. Black *et al.*, (1973, pp. 172-173 [438-439]).

Thorstein Veblen's strictures upon what he considered the Austrian preconception of human nature fit Jevons's or Walras's theory much better than they do Menger's. In Menger, man is not depicted as a hedonistic "lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift about the area, but leave him intact."⁵² Man, as Menger saw him, far from being a "lightning calculator," is a bumbling, erring, ill-informed creature, plagued with uncertainty, forever hovering between alluring hopes and haunting fears, and congenitally incapable of making finely calibrated decisions in pursuit of satisfactions. Hence Menger's scales of the declining importance of satisfactions are represented by discrete integers. In Menger's scheme of thought, positive first derivatives and negative second derivatives of utility with respect to quantity had no place; nothing is differentiable.

The absence of mathematical formulae and especially of applications of the classical calculus from Menger's work mark him off from Jevons and Walras in more than a formal sense. Carl Menger avoided the use of mathematics in his economics not because he did not know any better, but out of principle. When he wrote Léon Walras on June 28, 1883 that he had been for some time thoroughly acquainted with Walras's writings,⁵³ he did not disclaim, as did other correspondents, sufficient knowledge of mathematics to follow these writings, which we may be sure he would have done if that had been the case.⁵⁴ Instead, Carl Menger declared his objection *in principle* to the use of mathematics as a method of advancing economic knowledge. He granted that mathematics has its uses as an expository device and as a subsidiary "Hilfsmittel," but genuine research or investigation, Menger insisted, should be directed toward the discovery of the underlying elementary causes of economic phenomena in all their manifold complexity. For the performance of this task what is required is not the mathematical method, but a method of process analysis tracing the complex phenomena of the social economy to the underlying atomistic forces at work. He called it the "analytic-compositive method."⁵⁵

To understand what Menger meant by this, it may be useful to distinguish the type of *generative* causality Menger had in mind from the *logical* causality on which Léon Walras rested his case when he persisted in defending Auguste Walras's proposition, "La rareté est la cause de la valeur," as an analytically valid statement.⁵⁶ In Léon Walras's definitive

52. Veblen (1919, p. 73).

53. *Correspondence*, vol. 1, pp. 768, Letter 556.

54. See Hicks and Weber, (1973, p. 44, especially n. 11).

55. *Correspondence*, vol. 2, p. 4, Letter 602.

56. Walras (1874/..., §101 of the definitive edition; §98 of the 1st edition; §100 of the 2nd and 3rd editions).

general equilibrium model, proportionality between *raretés* and prices manifests itself everywhere: not only in exchange, but also in production, capital formation and the holding of money. Having been taught by his father to regard universal concomitance and exact proportionality as the criteria of causality,⁵⁷ Léon Walras felt that his construction of an overall system of simultaneous equations bound together by the marginal utility principle had proved that *rareté* is the cause of value. Menger, on the other hand, thought that the object of economic research was to discover those laws governing market phenomena which can be traced back to their ultimate genetic determinants in man's physiological, psychological and social nature. Mathematics cannot do this; the "analytical-compositive method" alone is appropriate.

The seeds of subsequent developments in economic theory found in Menger were very different from those found in Jevons and Walras. Several commentators on Menger have observed that Menger's non-calculus, numerical delineation of "scales of importance" of want satisfactions, being free from assumptions of continuity and differentiability, contained within it the germ of an ordinal, rather than a cardinal, conception of the measurement of utility.⁵⁸ Moreover, Menger's *Grundsätze*, with its stress on uncertainty in economic affairs and on the consequent search for information to mitigate the disadvantages of uncertainty,⁵⁹ foreshadowed present-day preoccupations with the stochastic and informational properties of economic systems. According to Carl Menger's son Karl Menger, a professional mathematician and an economist in his own right, the two eminent Austrians, Karl Schlesinger and Abraham Wald, who initiated crucial emendations of the Walrasian model, particularly on the side of the theory of production, drew their inspiration at least psychologically from the tradition in economics inaugurated by Carl Menger.⁶⁰

What more need be said, after this, as to the folly of sticking a single label, whether it be "Marginal Revolution" or anything else, on the contributions of Jevons, Menger and Walras respectively — as if they could be homogenized! Indeed, outside the stereotype textbooks on the history of economic thought, our three authors have been kept separate in the ordinary course of theoretical events. The leading theorists of our day do not even nod to Jevons or Menger; they walk with Walras, as Milton Friedman would say. Almost universally present-day writers on orthodox value theory refer to Walras alone as the founding father of their

57. Auguste Walras (1831/1938, Chapter XVI, especially p. 234; pp. 235-236 of the Leduc edition); see also Auguste Walras (1849/1938, p. 317 in the Leduc edition).

58. See, for example, Georgescu-Roegen (1968, p. 250).

59. Black *et al.*, (1973, pp. 166-168 [432-434]); and Hicks and Weber, (1973, pp. 61-74 and 164-189).

60. Hicks and Weber (1973, pp. 47-52).

theoretical faith.⁶¹

Perhaps the time has come to question that faith, as G. L. S. Schackle has done in a paper entitled "Marginalism: The Harvest."⁶² It is a harvest of doubts and difficulties profoundly considered and resolved so far as may be, not in the rejection of marginalism, but in the recognition of its limitations as a "frame of relevance and coherence" for a systematic explanation of how our economic universe works. Perhaps, too, a direct and close re-examination of the original texts of the 1870s may shed further light on the same troubling problem.

61. In a recent statistical study on the citation practices of doctorates in economics who received the degree between 1950 and 1955 from six major American universities, Stigler and Claire Friedland (1975, pp. 486-488) found that in the subsequent articles in value theory published by these doctorates in the period from 1950 to 1968, Walras stood third, after Hicks and Samuelson, in the total number of citations, with Menger and Jevons nowhere in the running.

62. Black *et al.*, (1973, pp. 321-336 [587-602]).

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