Paul A. Samuelson and the neoclassical synthesis

Version 2

Roger E. Backhouse

January 2014

Department of Economics
University of Birmingham
Edgbaston
Birmingham
B15 2TT
United Kingdom

Acknowledgement

This paper is written as part of a project, supported by a Major Research Fellowship from the Leverhulme Trust, to write an intellectual biography of Paul Samuelson. Whilst it is clearly part of the preparation for that, it should not be seen as a draft chapter, but as a separate paper. It is very much work in progress on a project that is in its very early stages. It is incomplete and because of the quotations from unpublished material, it should not be circulated. Comments are welcome.

1. Introduction

When the Swedish Academy of Sciences announced the award of the Nobel Memorial Prize in Economic Science to Paul Samuelson, the *New York Times* described him as "Leader of the economic mainstream" (Reinhold 1970). His pre-eminence amongst the rising generation of

economists had been recognized twenty years earlier when, at the age of 33, the AEA awarded him its first John Bates Clark medal, an award for which anyone under the age of 40 was eligible. He had, by that stage published articles covering many fields of economics—the consumer, capital, international trade, national income analysis, the business cycle, monetary economics and dynamic modeling, not to mention a string of articles in mathematics—but in many of these fields, his articles were seen as clarifying the theory to such an extent that that economists felt no need to go back to earlier literature. He also had two books to his credit: the recently-published *Foundations of Economic Analysis* (Samuelson 1947) and a textbook that would be published the following year, *Economics: An Introductory Analysis* (Samuelson 1948) and which would become an instant success.

The "neoclassical synthesis" is a term Samuelson introduced in the third edition of *Economics* (1955) and retained till the seventh edition (Samuelson 1967) after which it was dropped. It had a very specific meaning, that I will talk about in a moment, but I want to use it as a way into discussing Samuelson's role in economics and the relationship between his two first, and arguably most important works—*Foundations* and *Economics*. *Foundations* marks him out as a neoclassical economist, according to most peoples' understanding of the term. It was a work of synthesis, bringing seemingly disparate fields of economic together into a common analytical framework. So, though Samuelson did not himself describe it that way, it could be described as representing a neoclassical synthesis. Similarly, *Economics* was also a work of synthesis, though it was a different type of synthesis. The book's most obvious feature was the integration of national income analysis (the term "macroeconomics" was not yet in use, and Samuelson denied that he was a Keynesian) and traditional price theory (not yet called "microeconomics".

Juxtaposing these two books immediately raises the question of how these two syntheses are related. The modern literature on the micro foundations of macroeconomics leads to one possible answer: that *Foundations* provided the rigorous theoretical framework, based on rational agents interacting in competitive or imperfectly competitive markets, from which macroeconomic theory can be derived. Read this way, Samuelson becomes a forerunner of Don Patinkin, whose *Money, Interest and Prices* (1956; 1965) is often taken to sum up the old neoclassical synthesis, and Michael Woodford, whose *Interest and Prices* (2003) summed up the "new neoclassical synthesis" (see Backhouse, & Boianovsky 2013). Presumably Samuelson was content to leave the task of completing such a synthesis to others, for the beginning students who were the audience for *Economics* would typically be innocent of the mathematics necessary to understand Patinkin or Woodford, and in any case would rapidly be turned off by technical details.

However, that is not the story I want to tell. Instead, I would like to tell a story that draws a much clearer distinction between Samuelson and modern economics, by which I mean economics as it has developed since Robert Lucas and Gary Becker. Following an argument that Steven Medema and I have made elsewhere (see Backhouse, & Medema 2009) I claim that Samuelson, though he used the assumption of maximizing agents, was not a rational choice theorist in the sense that Lucas and Becker can be so regarded. The reason he did not go down the route towards the type of synthesis favored by Lucas and Becker was that he chose not to do so. The reason, I suggest, is that his conception of economics reflected attitudes formed during the Great Depression and the Second World War: it even contained traces of what is commonly described as "institutionalism". The syntheses found in *Foundations* and in *Economics* are different, though not inconsistent with each other.

This is a story about Samuelson. However, I suggest that it is also a story about what economics was like in the period when Pieter Hennipman, almost an exact contemporary of Samuelson's, was undertaking his main work. That period, running from 1937, the year when Hennipman and Samuelson both published their first articles, and the 1970s, was less like our own than we sometimes realize. It would be silly to suggest that Samuelson held the same view on *homo economicus* as Hennipman—he clearly attached great importance to maximizing behavior—but there were limits to his use of that assumption. This perspective on the era when Hennipman and Samuelson did their main work suggests that modern economists should be seen not as having refined older theories (though earlier theories have of course been refined) so much as having made theoretical choices that many of their predecessors chose not to make.

2. Foundations - synthesis through mathematics

Foundations of Economic Analysis was a much-expanded version of Samuelson's Harvard PhD thesis (1940), being written between 1937 and 1944, with publication having been delayed because of the complexity of the mathematical type-setting and wartime paper shortages. He introduced the book by explaining why there was reason to believe there might be a general theory to be found.

> The existence of analogies between central features of various theories implies the existence of a general theory which underlies the particular theories and which unifies them with respect to those central features. (Samuelson 1947, p. 3).

This was the opening sentence of *Foundations*, placed in italics for added emphasis. Working in diverse fields of economics he had noticed that he was deriving the same results time and time again. He had realized that economic theory could be unified through finding the more general—more abstract—theory that lay beneath fields of economics that tackled problems that were outwardly very different. What mattered was that seemingly different problems shared the same mathematical structure for it was this structure that determined the results that could be obtained.

As Samuelson made clear when he reflected on "How *Foundations* came to be" half a century later, the key figure was one of his Harvard teachers, Edwin Bidwell Wilson, with whom he took courses in mathematical statistics and mathematical economics. Wilson, a mathematician whose first publication had been a critique of Hilbert's "so called" foundations of geometry, was a polymath whose interests ranged from aeronautics (on which he had written a textbook) to public health and demography. Editor of the *Proceedings of the National Academy of Sciences,* active in the Social Science Research Council and a member of numerous scientific committees, Wilson "knew everything and everybody". Samuelson described his greatest virtue as being "his contempt for social scientists who pace the more exact sciences in a parrot-like way. He detested pseudo-learning and debunked many a pretentious theory …" (Samuelson 1998, p. 1376). However Wilson was not a complete sceptic about the use of formal theory, for he instilled in Samuelson the idea crucial to the synthesis offered in *Foundations*.

> I was vaccinated early to understand that economics and physics could share the same formal mathematical theorems (Euler's theorem on homogeneous functions, Weierstrass's theorems on constrained maxima, Jacobi determinant identities

underlying LeChatelier reactions, etc.), while still not resting on the same empirical foundations and certainties. (Ibid.)

It was the mathematics that was crucial.

The reason it was possible to find a common mathematical structure underlying so many diverse fields of economics and other disciplines (including physics, chemistry and biology) was that they all involved equilibrium systems. This is best illustrated with the Le Chatelier Principle, named after a nineteenth-century French chemist, Henri Le Châtelier, that stated that if there is a change in one of the variables determining an equilibrium, the equilibrium will change so as to counteract the effects of the change. Suppose that a flask contains a stable mixture of nitrogen (N_2), hydrogen (H_2) and ammonia (NH_3) and that the pressure is increased. Nitrogen and hydrogen will combine to increase the proportion of ammonia in the new equilibrium because this reduces the number of molecules in the flask (two nitrogen molecules and three hydrogen molecules combine to make two ammonia molecules), which reduces the pressure. However, though this is a theorem about chemical reactions, it involves a dynamic equilibrium and the resulting change can be deduced from its mathematical structure. Thus, though the Le Chatelier principle can be stated in terms of relationships between changes in pressure, temperature and the number of molecules in a gas, it can be stated in more general terms: that a change in one of the parameters of an equilibrium system results in changes in the equilibrium that counteract the initial change. The Le Chatelier principle is related to what Samuelson called, with a touch of irony, the Viner-Wong envelope theorem. For example, if the stock of capital is held constant, costs

cannot be lower than if use of capital were adjusted optimally: that long-run cost curves must be the envelope of short-run cost curves.

However, Samuelson did not just want to unify economic theory at an abstract level: he wanted to derive what, using the language of the Harvard Physicist, Percy Bridgman, he called "operationally meaningful theorems", by which he meant "hypotheses about empirical data which could conceivably be refuted, if only under ideal conditions" (Samuelson 1947, p. 4). It turned out that the existence of an underlying mathematical structure, derived from the assumption of equilibrium, served not only to unify economic theory but also to operationalize it. The Le Chatelier Principle could be used to derive propositions about how variables would change when one of the parameters that determined the equilibrium changed. Even though they faced different problems, in that maximizing profit subject to a production function was not the same as maximizing utility subject to a budget constraint, the fact that these were both maximization problems meant that similar results could be derived. A fall in the price of a factor of production could not cause the firm to use less of it; similarly a fall in the price of a consumer good could not, once income effects were removed, cause the quantity demanded to fall (Samuelson 1947, pp. 80-1, 116). These results might be thought obvious but others were less so. Drawing directly on the Le Chatelier principle, Samuelson that introducing rationing will make compensated demand curves less elastic (Samuelson 1947, pp. 168-9).

The structure to which Samuelson turned for his more general theory was the mathematics of constrained maximization, which formed the subject of Part I of his book. Economic theories based on mathematical models of maximizing behavior had a long history

before this book, going back at least to the nineteenth century. Joan Robinson (Robinson 1933), Edward Chamberlin (Chamberlin 1933) and John Hicks (Hicks 1939) had covered most of modern microeconomic theory, deriving most of the results found in postwar textbooks. So why was it that *Foundations* had the impact that it undoubtedly did and what did it do that had not been done before?

Samuelson consistently focused on the derivation of comparative statics results. In order to do this and at the same time to generalize the theory, Samuelson turned systematically to the theory of linear equations, for this provided a method by which problems with many variables could be solved. Given a system of simultaneous equations, this typically involved the use of determinants, a technique known by some economists but far from common. In addition, he went beyond traditional analysis in other ways.

The first of these was that he emphasized the analysis of *finite* changes and to do this he formulated optimum conditions in terms of *inequalities.* This is well represented by his theory of the consumer—the theory of revealed preference. This is summarized by the following result which, according to Samuelson, "contained almost all the meaningful empirical implications of the whole theory of consumer's choice" (Samuelson 1947, p. 111)

$$\sum_1^n p_i \Delta x_i \leq 0 \text{ Implies } \sum_1^n (p_i + \Delta p_i)\Delta x_i < 0 .$$

Economists usually stress the fact that this theory made it possible to dispense with the notion of cardinal utility. However, equally important, it involves finite changes and carries no implication that functions are differentiable. There was thus a natural transition from *Foundations* to the linear modeling of economists such as Wassily Leontief (another of Samuelson's Harvard teachers) and Cowles Commission researchers such as Tjalling

Koopmans and George Danzig, and Samuelson's third major book, *Linear Programming and Economic Analysis* (Dorfman et al 1958). In such models the equalities of marginal conditions found in traditional theory did not hold. Results depend simply on general notions of convexity.

The second way in which Samuelson went beyond traditional theory was in his treatment of dynamics. Once again, he went significantly beyond traditional theory. He formalized the well-known adjustment rules, that prices change in response to excess demand, generalizing this to multiple markets where supplies and demands depend on all prices in the system. However, he also explored the properties of more general linear and non-linear systems and enunciated what he called the "correspondence principle"—that stability conditions could be used to derive comparative statics results.

What made the correspondence principle significant was that Samuelson did not believe that all dynamic systems could be modeled as the outcome of optimizing behavior; if there was no optimization, then there would be no second order conditions from which to derive comparative statics results. Though he considered other models, the clearest example of this was the multiplier-accelerator model of the business cycle in which the interaction of the multiplier and accelerator resulted in a second order difference equation,

$$Y(t+2)-\alpha(1+\beta)Y(t+1)+\alpha\beta Y(t)=P(t)$$

in which α is the marginal propensity to consume and β is the accelerator coefficient. Significantly, instead of setting the left hand side equal to zero, he set it equal to P(t), a periodic movement such as a sine wave. This enabled him to discuss a mixture of endogenous and exogenous factors generating cycles. He also considered stochastic difference equations, even though the bulk of the economic theory he presented was non-stochastic.

If all fields of economics could be reduced to maximization problems, there would be a complete synthesis: economics would simply be the science that studies optimization, much as Lionel Robbins (1932) had defined it. However, by acknowledging that some problems could not be reduced to maximization (whether because individual agents were not maximizing or because aggregated did not behave like individuals) Samuelson implicitly stopped short of a complete integration of the subject. The correspondence could substitute for second order conditions in deriving comparative statics results, but this was not the complete integration that would prevail if all problems involved maximization.

3. Economics and the neoclassical synthesis

In his textbook, Samuelson made no claim to be providing a general theory of economics. He did begin by talking about "universal economic conditions but this involved little more than the claim that all societies faced certain very general problems. Societies might face limits on what they could produce, and the dynamics of population might be similar in all societies, but he did not suggest was sufficient to construct a general theory. However, in the third edition of *Economics* he introduced the term "neoclassical synthesis", using the term sufficiently often (there are twelve index entries, scattered through out the book) to make it clear that it was an idea to which he attached considerable importance. In the 1960s and 1970s the term was taken up, mainly by heterodox economists, who wanted a label for the orthodoxy from which they were trying to differentiate themselves. The result was that the neoclassical synthesis came to be identified with the methods by which Samuelson had sought to integrate economics in *Foundations* (see Backhouse RE2014).

However, the synthesis about which Samuelson wrote in his third edition was very different from the general theory to which he alluded in *Foundations*. He defined the "neoclassical synthesis" in the following two paragraphs, both of which were set in italics for emphasis.

> Neoclassical synthesis: by means of appropriately reinforcing monetary and fiscal policies, our mixed-enterprise system can avoid the excesses of boom and slump and can look forward to healthy, progressive growth.
>
> This fundamental being understood, the paradoxes that robbed the older classical principles dealing with small-scale "microeconomics" of much of their relevance and validity—these paradoxes will now lose their sting. In short, mastery of the modern analysis of income determination genuinely validates the basic classical pricing principles; and—perhaps for the first time—the economist is justified in saying that the broad cleavage between microeconomics and macroeconomics has been closed. (Samuelson 1955, p. 360).

More succinctly, he argued that "if modern economics does its task so well that unemployment and inflation are substantially banished from democratic societies, then its importance will wither away and the traditional economics (whose concern is with the *wise* allocation of fully employed resources) will really come into its own—almost for the first time" (ibid., p. 11). Even more succinctly, he argued that "successful income stabilization validates the classical principles of economics" (ibid., p. 666, n. 2).

This definition posits a clear distinction between "modern economics"—identified with the modern theory of income determination—and "classical" theory, which deals with the efficient allocation of fully-employed resources. The synthesis was described as

"neoclassical" on the basis of its being a combination of modern and ancient (classical) ideas, but there was no implication that these two sets of ideas were derived from a common theoretical framework. Samuelson's argument was that there was a need for one theory to tackle problems of unemployment and another theory to tackle problems of full employment. This view that different types of theory were needed for different situations was echoed in the literature on what were then called "underdeveloped countries"—different types of economics were needed for countries at different stages of development. It took wise policy, guided by one type of economics, to render another type of economics relevant.

Samuelson claimed that this neoclassical synthesis represented a consensus viewpoint, accepted by most American economists.

> In recent years 90 per cent of American economists have stopped being "Keynesian economists" or "anti-Keynesian economists." Instead they have worked toward a synthesis of whatever is valuable in older economics and in modern theories of income determination. The result might be called neoclassical economics and is accepted in its broad outlines by all but 5 per cent of extreme left-wing and right-wing writers. (Ibid., 212)

In this passage, Samuelson sought to distance the theory of income determination from Keynesianism, implicitly recognizing that the terms "Keynesian" and "anti-Keynesian" were politically charged through arguing that the neoclassical synthesis was thus a political consensus. If traditional "classical" theory were seen as conservative, then so too was the neoclassical synthesis. Samuelson presented it not as a justification of Keynesian economics but as a vindication of "real classical truths" (ibid., p. 569). Those "truths" were not just theoretical propositions but involved statements about the real world that were relevant for

policy—"classic truths and principles of social life" (ibid., p. 733). Thus the neoclassical synthesis—the use of proper monetary and fiscal policy—could render valid John Stuart Mill's claim that imports, not exports, add to a nation's well being (ibid., p. 623). The neoclassical synthesis validated the case for free trade, undermining the argument that tariff protection was needed to cure unemployment for it was more efficient to use monetary and fiscal policy for this purpose (ibid., p. 659). It made it possible to solve the challenging problems of international economics (ibid., p. 676). When Samuelson turned to the problem of economic growth, after claiming that twenty years earlier it might have been difficult to answer "the neo-Marxian theory of imperialism", he wrote,

> Perhaps we should be thankful that the Russian economists have not mastered modern elementary economics; that they do not yet understand the "neoclassical' synthesis which, combining modern income determination with the older economic theories of resource allocation, clearly demonstrates the ability of resolute free societies to dissipate the ancient fear of mass unemployment. (Ibid., p. 709)

The political dimension of the neoclassical synthesis, as a body of ideas that could help the United States fight the Cold War against communism, could hardly have been any clearer.

Samuelson's linking of the the theory of income determination with traditional theory can clearly be traced back to the final chapter of John Maynard Keynes's General Theory (Keynes 1972 [1936][1936], p. 378) in which he said of the classical theory,

> Its tacit assumptions are seldom or never satisfied, with the result that it cannot solve the economic problems of the actual world. But if our central controls succeed in

> establishing an aggregate volume of output corresponding to to full employment as nearly as is practicable, the classical theory comes into its own again from this point onwards.

The failure of capitalism lay in its failure to generate sufficient investment to absorb full-employment savings, and if this problem could be solved by monetary and fiscal policy, the price mechanism could be relied upon to allocate resources reasonably well. Keynes stressed the conservative implications of this theory, arguing strongly that it would make it possible to preserve individual freedom, for if government ensured a sufficiently high level of aggregate demand, private investors could be responsible for decisions about the type of investment undertaken.

The idea behind the neoclassical synthesis can be found in the *General Theory*, a book Samuelson will certainly have read from cover to cover in 1936, but though he came close to incorporating it into early drafts, it was absent from the first two editions of his textbook (Samuelson 1948; Samuelson 1951). This is despite the fact that an early draft, the "Second preliminary edition" (Samuelson PA, 1946, Economics: an introductory analysis,) used "The economics of full employment" as the heading for Part III, covering microeconomics, the distribution of income, international trade, and "the dynamics of speculation and risk". The importance Keynes attached to speculation in his explanation of unemployment makes the inclusion of the last of these particularly striking. Samuelson had clearly absorbed what Keynes had said in his closing chapter.

However, in the first edition this heading is gone, replaced by the much more bland, "Composition and pricing of national output". There appears to be no evidence on the reasons for this change though is not hard to find explanations. If these theories really did apply only

under conditions of full employment, then their applicability was strictly limited and Samuelson could be criticized for failing to provide any theory of resource allocation during peacetime and, given the extent of controls during wartime, it was hardly realistic as an explanation of allocation in wartime either.

Further evidence on Samuelson's use of the term "neoclassical synthesis" is provided by the context in which he used it. His main definition came in a short Epilogue to a chapter, "Fiscal policy and full employment without inflation", in which he explained how the cycle could be controlled. In the first two editions, the emphasis had been on the *difficulty* of creating a healthy economy. The recently passed Employment Act of 1946 affirmed the responsibility of the government to fight mass unemployment and inflation, but the measures it proposed might not be sufficient, for it was also necessary to attend to "the proper relations of prices and different branches of production" (1948, p. 436; 1951, p. 419). He did no more than hint at the possibility that the problem of effective demand might be cured, ending his discussion of the Employment Act with the sentence, "If ever the curse of general inflation or deflation has been banished, there will rise to the top of our national policy agenda—and properly so—the true and abiding universal economic problems which every economic society has had to face since the Garden of Eden" (ibid.).

In the third edition the tone was completely different. When the first edition had been published, unemployment was around 3½ per cent and rising.[1] Wartime controls had only just been removed and the outlook was far from clear. The Employment Act was recent legislation and no one knew how it would work out in practice. When the second edition

[1] Statistics in this paragraph are taken from Samuelson 1955, p. 208. They agree with those in earlier editions.

appeared, unemployment had been at or over 5 per cent for two years and though it fell in 1951, even if Samuelson had anticipated this by the time the book went to press, it could be attributed to the Korean War, which was also contributing to high inflation. There were no grounds for confidence about the normal level of peacetime activity. In contrast, by the time of the third edition, there had been two years of low unemployment (2.7 and 2.4 percent) and, though Samuelson thought it would be much higher in 1954, there was evidence that even Republicans were committed to the goal of full employment, the chapter having opened with a quotation from Dwight Eisenhower: "I give you this assurance: every legitimate means available to the Federal Government that can be used to sustain prosperity will be used" (Samuelson 1955, p. 336). Samuelson replaced the sentence referring to the Garden of Eden with the much more positive, "This chapter's Eisenhower quotation affirms that full-employment policy is bipartisan in American politics" (ibid., p. 360).

What this shows is that the neoclassical synthesis was introduced in response to a changed political and economic situation when, for the first time since the war, it seemed possible that mass unemployment might be eliminated. The United States could turn its attention from demand management to microeconomic issues. The neoclassical synthesis explained that there was no inconsistency in this shift of emphasis.

3. Samuelson and the demise of interwar pluralism

The previous economist to establish an orthodoxy, at least in the English-speaking world, was Alfred Marshall. Though usually described as a neoclassical economist—his attempt to reconcile the new mathematical theories of utility maximizing consumers with the cost-

focused theories of economists from Adam Smith to John Stuart Mill was what justified Veblen's use of the term—Marshall was in fact a synthesizer who sought to combine marginalism with historicist ideas.[2] Because of his attempt to synthesize mathematical and historical ways of thinking, when it migrated to the United States, Marshall's economics appealed not just to "neoclassical" economists but to all schools of thought, including many who were to adopt the label "institutionalist" after 1919 (Backhouse et al 2010). His economics was so far reaching because it appealed across the spectrum of American economics in a way that the work of, Walras or Pareto did not.

Samuelson's *Foundations of Economic Analysis* (Samuelson 1947), though it challenged and developed that tradition, was predominantly neoclassical in the traditional meaning of the term. It might analyze the mathematics of business cycle theories that could not be reduced to assumptions about optimizing individuals, but the focus of the book was on optimization by agents who were correctly informed about the constraints they faced. However, *Economics* was very different. It was not a translation into simple language of results proved rigorously in *Foundations*. The book began with substantial chapters the main institutions: individuals, families, businesses, federal and local government, trade unions (Samuelson 1948, chapters 4 to 10, pp. 61-224) and in correspondence with friends, he repeatedly described it as highly institutional, a claim that was entirely justified. Moreover, though he attached importance to formal mathematical theory, he made it clear that it could not explain everything.

Samuelson covered the theory of profit-maximizing firms, drawing heavily on his teacher, Edward Chamberlin's *Theory of Monopolistic Competition* (1933) but he claimed that, in the real world, the theory needed to be qualified.

[2] On Marshall's historicism, see Cook 2009, and various essays in 2006.

> Realistically speaking, we must recognize that modern business firms—even the largest—are unable to calculate their marginal revenue and marginal cost. They cannot determine their optimum price and output with nice exactitude. Yet the day's work must somehow get done. Prices must be set on their products. (Samuelson 1948, p. 510)

Firms could not ignore profits completely, for any that did would go out of business, but the assumption that they maximized profits could be no more than an approximation. In practice, he argued, prices would be set as a mark up on unit costs which might or might not lead to the profit-maximizing price being set. This theory was realistic but explained nothing because it did not explain how the mark up was determined. Rather than fill the gap with a formal theory, Samuelson chose to consider how prices would be set in four different types of market. These market types, including "Regulated markets" and "chronically overcrowded sick industries" were as much descriptive rather than ones derived from neoclassical theory (Samuelson 1948, pp. 511-5).

His discussion of the marginal productivity theory of income distribution was very cautious in the claims made for the theory. He pointed out that where there was joint production it was possible that marginal productivity might do no more than establish that the shares of labour and capital must be between 0 and 100 per cent, an entirely useless proposition (he did not talk in terms of fixed coefficients, but he will clearly have been thinking of such models, with which he was very familiar).[3] Marginal productivity was no more than part of a theory of the demand for factor services. He claimed that the only

[3] He was a student of Wassily Leontief, who included input-output models in the syllabus of a course Samuelson took at Harvard. He was also engaged in discussions with Tjalling Koopmans and others working on linear modeling.

"formally satisfactory" solution to the problem of determining factor prices was "one of 'general equilibrium' in which there is a simultaneous interplay of the supplies and demands for *all* economic magnitudes under conditions of either perfect or imperfect competition". However he went on to minimize what such a theory could achieve. "Unfortunately," he wrote, there is little that can be said about this general supply and demand problem which is very useful in understanding the distribution of income between rich and poor, between labor and property owner, between one kind of property owner and another" (Samuelson 1948, p. 529).

Samuelson has almost universally been seen as a Keynesian. Given that Keynes claimed to have broken completely with the past the implication is that Samuelson had turned his back on "pre-Keynesian" macroeconomic thinking. However, in all his writings up to and including the first edition of his textbook, Samuelson distanced himself from Keynes. The remarks he made when he introduced the theory of income determination are typical.

> Although much of this analysis is due to an English economist, John Maynard Keynes …, today its broad fundamentals are increasingly accepted by economists of all schools of thought, including, it is important to notice, many writers who do not share Keynes' particular policy viewpoints and who differ on technical details of analysis.
>
> The income analysis here described is itself neutral: it can be used as well to defend private enterprise as to limit it, as well to attack as to defend government fiscal intervention. When business organizations such as the Committee for Economic Development or the National City Bank use the terminology of saving and investment, it is absurd to think that this implies that they are "Keynesian" in the sense of belonging to that narrow band of zealots associated with some of the policy

> programs that Keynes himself espoused during the great depression. (Samuelson 1948, p. 254).

Samuelson claims that savings-investment analysis is an ideologically neutral technique used across the political spectrum, and he uses language (zealotry) that implies strong criticism of Keynes and his followers.

Given the way the book was attacked for its Keynesianism, perceived by some businessmen as hostile to the free markets on which American capitalism was based (see Giraud 2014), it is natural to see this as a defensive move. However, it was much more than that. For ten years, Samuelson had been personally and intellectually very close to Alvin Hansen. Hansen began his career as a business cycle theorist working in the American institutionalist tradition. In the 1920s and 1930s, he developed theories of the cycle that stressed the flow of innovations as the motive force behind the cycle, relying heavily on the mechanism of the acceleration principle. Though he is widely seen as having been converted to Keynes, it is more accurate to say that he accepted certain Keynesian ideas when he realized that they could be incorporated into his own theoretical system. He changed his mind about Keynes because he thought Keynes had been converted to his own way of thinking (see Mehrling 1997).

Samuelson's earliest work on the business cycle involved translating Hansen's multiplier-accelerator model (presented purely verbally with numerical examples) into algebra, and working out its properties (Samuelson 1939a; Samuelson 1939b). What is less well understood is how close Samuelson's approach to the problem of income determination was to Hansen's. This comes across most clearly in his discussions of investment where his

talk of innovations, limited opportunities for investment, and population growth. On technical progress, he wrote,

> From the 1950's to the 1870's railroads were built all over the world. In the next two decades nothing quite took their place. The automobile and public utilities produced a similar revolution in the 1920s. In the 1930's plastics, air conditioning, radio, television, etc., were of trifling importance as contributing to total net investment. (Samuelson 1948, p. 256)

He concluded that as regards the level of investment, "we are in the lap of the gods". This is typical Hansen and quite unlike Keynes. Discussions of the business cycle occur throughout Samuelson's discussion of the macroeconomic phenomena: indeed as late as the second preliminary draft of *Economics*, in 1946, he still placed the chapter on income determination *after* a chapter on the business cycle. It was only with the published version that this order was reversed.

These examples, show that, despite his later talk of a neoclassical synthesis, what Samuelson brought together in his textbook was not just "neoclassical" economics and Keynesian macroeconomics. There was a strong dose of pre-war "institutionalist" economics, both in his discussions of markets and in his coverage of the business cycle. Certainly by the standards of subsequent developments in economics, the first edition of Samuelson's *Economics* was not a particularly "neoclassical" textbook. There are also strong reasons to take very seriously his claim, made explicitly in his obituary of Keynes in *Econometrica* (1946), that he was not a Keynesian. Samuelson's eclecticism and his concern with realism suggest that the parallels between Samuelson's textbook and Marshall's are greater than one might expect from the author of *Foundations*, who was very critical of Marshall; in both

cases, eclecticism must have been a major reason why the books were so successful. The stress on institutions and the endorsement of Hansen's blending of institutionalist business cycle theory with Keynes's multiplier—are both important to explain the emergence of the orthodoxy represented by the neoclassical synthesis.

5. Conclusions

The neoclassical synthesis originated in Keynes's *General Theory*, when Keynes speculated on what might be possible demand management could be used to maintain full employment and end the problem of scarcity. Unlike Keynes, Samuelson never thought scarcity could be eliminated. However, when it looked as though the idea of demand management to maintain full employment had bipartisan support, he used the idea that classical theory might come into its own at full employment to to rationalize placing the theory of income determination in a textbook alongside traditional microeconomic theory.

This synthesis was very different from the unified theory to which he looked forward in *Foundations*, based instead on mathematical structures that were common to different branches of economics. Even in *Foundations* he had stopped short of completely unifying economic theory in that he recognized that some economic systems could not be modeled as maximizing systems: this was the rationale for introducing the correspondence principle, something that would otherwise be redundant. To achieve such a synthesis he would have had to go down the route later followed by Oskar Lange, Franco Modigliani, Don Patinkin and the "micro foundations" literature Backhouse, & Boianovsky 2013). As Lucas (Lucas 1995) implicitly recognized when, on receiving the Nobel Memorial Prize, he acknowledged the

importance of the book for his own education, this literature built on the theory developed in *Foundations*. Thus critics of this conception of economics, based on modeling all human behavior as the outcome of rational choices, naturally labelled it "the neoclassical synthesis" and attributed it to Samuelson.

Samuelson, on the other hand, chose not to go down this route. His synthesis had been of a very different nature. It was less rigorous, more in the spirit of Marshall's attempt to use formal modeling to analyze problems that were too complicated to force into a single formal model. Samuelson attached importance to imperfect competition, non-maximizing behavior and to the fact that aggregates might behave in ways that were very different from the ways in which individuals behaved. Even though he never derived a formal model model to explain why, he never departed from the idea that government intervention was necessary to bring about full employment. His textbook was full of praise for the market but, as his business critics in the 1940s and 1950s recognized, he was by then an eloquent advocate of New Deal liberalism, with its belief that government intervention was needed to rectify market failures. The third and fourth editions, in which he may have adopted a slightly more conservative tone,[4] and his use of the rhetoric of the "neoclassical synthesis" would appear to carry traces of the Cold War, but he remained a liberal and continued to use the term in the way he had done when he first introduced it.

Thus although the neoclassical synthesis was the orthodoxy of the 1950s and 1960s, it was understood in two different ways, echoing the contrast between *Foundations* and *Economics*. Alongside the formal theoretical synthesis of Patinkin there was also a working

[4] This is put this way because I have not yet done the work on the 1950s necessary to be more definite. I should add that this whole section is speculative. It is based on detailed research on Samuelson's work in the 1940s, but I have yet to tackle his later views in the same way.

synthesis in which macroeconomists worked with theories of price and output determination that they could not reduce to individual's optimizing behavior. However, despite the fact that it was so prominent, Samuelson's own version of the neoclassical synthesis was never properly analyzed, with the exception of a brief and critical analysis by Kenneth Arrow (Arrow 1967, p. 735).[5] It was taken for granted that the author of *Foundations* must have had in mind a rigorous integration of micro and macro, based on foundations of rational choice theory, even though he did not. As a result, the extent to which *Economics* drew upon non-neoclassical American economic literature was overlooked. The methodological purity introduced by Lucas and his followers was not found in the work of Samuelson or many of his generation.

References

Arrow, K.J., 1967, Samuelson Collected, *Journal of Political Economy*, 75(5), pp. 730-7.

Backhouse, R.E. & Boianovsky, M. 2013. *Transforming Modern Macroeconomics: Searching for Disequilibrium Microfoundations, 1956-2003,* . Cambridge University Press, Cambridge.

Backhouse, R.E. & Medema, S.G., 2009, Retrospectives: On the Definition of Economics, *Journal of Economic Perspectives Journal of Economic Perspectives*, 23(1), pp. 221-33.

[5] Arrow made this assessment in the course of reviewing Samuelson 1966a; Samuelson 1966b. He argued that there was no reason to think that an economy that needed government policy to maintain full employment would behave at full employment in the same way as one that did not.

Backhouse, R.E., Bateman, B.W. & Medema, S.G. 2010. The reception of Marshall in the United States, in T Raffaelli, G Becattini, K Caldari & M Dardi (eds), *The Impact of Alfred Marshall's Ideas,* Edward Elgar, Cheltenham, pp. 59-80.

Backhouse RE. 2014. The neoclassical synthesis and the emergence of heterodox economics, Unpublished paper.

Chamberlin, E.H., 1933. *The Theory of Monopolistic Competition,* . Harvard University Press, Cambriedge, MA.

Cook, S.J., 2009. *The Intellectual Foundations of Alfred Marshall's Economic Science: A Rounded Globe of Knowledge,* . Cambridge University Press, Cambridge.

Dorfman, R., Samuelson, P.A. & Solow, R.M. 1958. *Linear Programming and Economic Analysis,* . McGraw Hill, New York.

Giraud, Y., 2014, Negotiating the "middle-of-the-road" Position: Paul Samuelson, MIT and the Politics of Textbook Writing, 1945-55, *History of Political Economy*, forthcoming.

Hicks, J.R., 1939. *Value and Capital,* . Oxford University Press, Oxford.

Keynes, J.M., 1972 [1936]. *The General Theory of Employment, Interest and Money, The Collected Writings of John Maynard Keynes*, Vol. VII. Macmillan, London.

Lucas, RE 1995, Robert E. Lucas, Jr. - Biographical, Retrieved December 16, 2013, from http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1995/lucas-bio.html

Mehrling, P., 1997. *The money interest and the public interest : American monetary thought, 1920-1970,* . Harvard University Press, Cambridge, Mass..

Patinkin, D., 1956. *Money, Interest and Prices,* . Row, Peterson, Evanston, IL.

Patinkin, D., 1965. *Money, Interest and Prices,* 2nd ed. . Harper and Row, New York.

Raffaelli, T., Becattini, G., & Dardi, M. (eds), 2006. *The Elgar Companion to Alfred Marshall,* . Edward Elgar, Cheltenham.

Reinhold, R., 1970, Leader of economic mainstream, *New York Times,*27 October 1970, p. 8.

Robbins, L.C., 1932. *An Essay on the Nature and Significance of Economic Science,* . Macmillan, London.

Robinson, J., 1933. *Economics of Imperfect Competition,* . Macmillan, London.

Samuelson, P.A., 1939a, Interactions Between the Multiplier Analysis and the Principle of Acceleration, *The Review of Economics and Statistics*, 21(2), pp. 75-8. **CSP 2:82.**

Samuelson, P.A., 1939b, A Synthesis of the Principle of Acceleration and the Multiplier, *Journal of Political Economy*, 47(6), pp. 786-97. **CSP 2:83.**

Samuelson, P.A., 1946, Lord Keynes and the General Theory, *Econometrica*, 14(3), pp. 187-200.

Samuelson, P.A., 1947. *Foundations of Economic Analysis,* . Harvard University Press, Cambridge, MA.

Samuelson, P.A., 1948. *Economics: An Introductory Analysis,* 1 ed. . McGraw Hill, New York.

Samuelson, P.A., 1951. *Economics: An Introductory Analysis,* 2 ed. . McGraw Hill, New York.

Samuelson, P.A., 1955. *Economics: An Introductory Analysis,* 3 ed. . McGraw Hill, New York.

Samuelson, P.A., 1966a. *The collected scientific papers of Paul A. Samuelson,* Volume 2, Stiglitz, J.E.(ed.), . MIT Press, Cambriodge, MA.

Samuelson, P.A., 1966b. *The collected scientific papers of Paul A. Samuelson,* Volume 1, Stiglitz, J.E.(ed.), . MIT Press, Cambridge, MA.

Samuelson, P.A., 1967. *Economics: An Introductory Analysis,* 7 ed. . McGraw Hill, New York.

Samuelson, P.A., 1998, How Foundations Came to Be, *Journal of Economic Literature*, 36(3), pp. 1375-86. **CSP 7:586.**

Samuelson, P.A., 2011b. *The collected scientific papers of Paul A. Samuelson,* Volume 7, Murray, J.(ed.), . MIT Press, Cambridge, MA.

Samuelson PA. 1940. *Foundations of Analytical Economics: The Observational Significance of Economic Theory.* Harvard PhD Thesis.

Woodford, M., 2003. *Interest and Prices,* . Princeton University Press, Princeton, NJ.