Between Walras and Marshall: Menger's Third Way

David Glasner

November 2021

Abstract: Neoclassical economics is bifurcated between Marshall's partial-equilibrium and Walras's general-equilibrium analyses. Given the failure of neoclassical theory to explain the Great Depression, Keynes proposed an alternative explanation of the involuntary unemployment of the 1930s. Within two decades, Keynes's contribution was subsumed under the neoclassical synthesis of the Keynesian and Walrasian theories. Lacking microfoundations consistent with the assumptions of Walrasian theory, the neoclassical synthesis collapsed. But Walrasian general-equilibrium theory itself provides no plausible, much less axiomatic, account of how general equilibrium is, or could be, achieved. Whatever plausibility is attributed to the assumption that price flexibility leads to equilibrium derives from Marshallian partial-equilibrium analysis, with market prices adjusting to equilibrate supply and demand. But Marshallian partial-equilibrium analysis presumes that all markets, but the small one being analyzed, are at, or close to, equilibrium, so that price adjustments in the analyzed market neither affect, nor are affected by, other markets. The demand and cost (curves) of partial-equilibrium are drawn on the assumption that all other goods and factor prices reflect Walrasian general-equilibrium values. While based on Walrasian assumptions, modern macroeconomics implicitly relies on the Marshallian intuition that agents already know or anticipate the prices and costs consistent with general equilibrium, aside from random disturbances, which lead to immediate revision of rational expectations in all markets. Menger's third way offers an alternative to the current conceptual impasse. Mengerian subjectivism recognizes that nearly all economic activity is subjective and guided by expectations of the future. Current prices are set based on expectations of future prices, so equilibrium is possible only if agents share the same expectations of future prices. If current prices are set in light of differing expectations, arbitrage opportunities are created, causing price changes and expectational changes, leading to further arbitrage, expectational change, and so on, but not necessarily to equilibrium.

Between Walras and Marshall: Menger's Third Way

I Introduction

Of the three originators of the Marginal Revolution, Menger, Jevons and Walras, one (Jevons) died prematurely in 1882 of ill health before his work could exert much influence on the subsequent development of economics, even among Anglophone economists. Jevons's place was, of course filled by Alfred Marshall, who had independently developed his own marginal-utility theory of value. Leon Walras, by contrast, continued revising his path-breaking treatise of 1874 in successive editions, but the influence of his work was at first limited to a very narrow audience of economists able to comprehend its formidable mathematical exposition. Not until the twentieth century, owing to the works of Vilfredo Pareto and Irving Fisher, but especially that of J. R Hicks in the 1930s, did the importance of Walras's work become widely recognized among Anglophone economists

Thus, partly owing to its own virtues and partly by default, it was Menger's work that was initially the most influential of the three great founding works of the Marginal Revolution, certainly the most influential on the European continent, even as the work of Marshall became dominant among the Anglophone economists by the l890s.[1] However, as the influence of Walras has steadily grown since the 1930s, that of Menger had suffered corresponding diminution, Menger now being acknowledged for his early work but otherwise largely forgotten outside the ranks of what is still called the Austrian school of economics.[2]

---

[1] Although even Menger's work was not widely read in the original even on the Continent, the works of his disciples Böhm-Bawerk and Wieser transmitted Menger's teaching to a wider audience of European and some English speaking economists. Marshall, by contrast, felt no intellectual debt to Jevons, though conceding the prior discovery of marginalist ideas by Jevons, Menger and Walras.

[2] It is of course one of the remarkable quirks of history that Carl Menger's son, the mathematician Karl Menger, who was at the University of Vienna in the 1920s and 1930s was the teacher and doctoral adviser of Abraham Wald, who through Menger's introduction found employment at the Austrian Institute of Business Cycle Research which was founded by Ludwig von Mises and was under the direction of F. A. Hayek and later Oskar Morgenstern. It was through Wald's association with Karl Schlesinger, a friend of Menger's, that Wald began working on the problem of finding a solution to Walras's general equilibrium equations. Realizing that the equality between the number of unknowns and the number of equations did not, as Walras and Irving Fisher assumed, ensure the existence of a solution to those equations, Wald (1935) published the first existence proof for a simplified linear version of a Walrasian system of equations. However, Menger, a student of the mathematician L. E. J. Brouwer, presumably realized the relevance of Brouwer's fixed point theorem to the existence question and, as a result John von Neumann, a frequent participant at, and contributor to, Menger's mathematical colloquium deployed Brouwer's fixed point theorem in a 1934 paper on an economic growth model, and Wald in a later, but never published paper, deployed the fixed point theorem in a more general existence proof than that of his 1935 paper, thereby anticipating

Indeed, the Walrasian branch of the Marginal Revolution now defines the dominant neoclassical paradigm especially among pure theorists and theoriticians. However, the Marshallian partial-equilibrium paradigm remains the routine modeling framework of empirical researchers and applied microeconomists, and it provides the basic framework to which most students are first exposed in introductory and even intermediate textbooks and coursework.

And although macroeconomics as a subdiscipline of economics originated from the work of Keynes who, despite his lapse from Marshallian orthodoxy, was a product of the Marshallian tradition, his work remained in many, if not most respects, solidly within the Marshallian tradition from which he dissented. However, soon after launching his revolution against received orthodoxy, his work was largely overtaken and recast within the Walrasian paradigm by many of his avowed followers who formulated the neoclassical synthesis of Keynesian and Walrasian analysis. That synthesis proved untenable and, after a brief Monetarist interlude, was ultimately displaced by an explicitly Walrasian paradigm upon which modern macroeconomic theory, whether in its New Classical, Real-Business Cycle, or New Keynesian versions, has been constructed.

This paper explores differences in the perspectives and underlying assumptions of the Walrasian and Marshallian approaches as well as their underlying similarities and common shortcomings. Despite what I consider superficial differences, the Marshallian and Walrasian paradigms are logically intertwined and mutually interdependent, so that their defects and shortcomings are largely shared. While those defects and shortcomings do not invalidate them, they are too often overlooked or ignored both theoretical and applied studies.

The main thesis of this paper is that the distinctive approach taken by Carl Menger in his seminal work of 1871, despite sharing a fundamental insight into the concept of marginal utility with the other Marginal Revolutionaries, suggests an alternative to the Marshallian and Walrasian theories that may avoid some of the common defects and shortcomings that beset the dominant neoclassical theories. Although my focus in this paper is on the implications of these

---

the work of Arrow, Debreu and McKenzie. It is perhaps of further interest to note that Arrow and Wald worked together in World War II (along with W. A. Wallis, George Stigler and Milton Friedman, in the statistical studies of the US War department) and that Arrow was later a graduate student at Columbia while Wald was in the economics department and the nascent mathematical statistics department at Columbia. Brouwer's fixed point theorem was also deployed by von Neumann and Morgenstern (1944) and by Nash (1950), so the indirect influence of Menger extends to the other important branch of modern mathematical economics.

shortcoming for the development and current practice of macroeconomics, I believe the argument has broader implications for both theoretical and applied work..

II Conflicting Walrasian and Marshallian Intuitions and the Explanatory Gap

Leon Walras was a pure theorist who aimed to create a general model as an ideal representation of a competitive economic system and its operation (Jaffe). A theorist of a more practical bent than Walras, Alfred Marshall wanted to make economic theory sufficiently realistic to be accessible and useful to both market participants and policy makers.

Walras fashioned a theory of the equilibrium of an entire system: a general equilibrium. Although the equilibrium he described is a systemic equilibrium, it is also describes an equilibrium (what would later be termed an optimum) for each of the agents constituting that system. What defines the equilibrium, given the initial resource endowments of all agents, their utility functions, and the production technologies accessible to them, is a vector of prices for all goods, services and assets at which the optimal choices, conditional on those prices, of each agent to produce or consume can be simultaneously executed. In other words, the total quantity demanded by all agents of each commodity or service is no greater than the total quantity supplied of all those commodities whose prices are positive and the total quantity supplied equals or exceeds the total quantity demanded for commodities whose price is zero.

This definition of equilibrium is straightforward, but Walras could only show that, under conditions that he could not fully specify, a systemic equilibrium might exist, not that there is an actual economic mechanism system that would reach, or even approach, it.[3] Recognizing the gap in his account of general equilibrium, Walras attempted, in successive editions of his great work, to provide an intuitive explanation of that process, which he called tâtonnement, in which a fictitious auctioneer would announce a price vector at which trading could take place (Jaffé). Agents would submit their plans for purchases and sales to the auctioneer who would calculate their planned purchases and sales to determine whether the price vector would result in an equilibrium. If so, the work of the auctioneer would be concluded; if not, the auctioneer would

[3] Walras's proof, like those of other early theorists, consisted only in showing that the number of independent equations determining equilibrium prices of all goods and services equaled the number of prices to be determined. It eventually was realized (Wald 1935) that equality of the number of equations and the number of unknowns does not guarantee the existence of a solutions.

try again to find the equilibrium price vector (presumably raising the prices of goods in excess demand and reducing the prices of good in excess supply) and the process of calculating desired purchases and sales at the new price vector would be repeated.

Walras suggested that tâtonnement is analogous to the process of price determination in competitive markets, prices rising when quantity demanded exceeds quantity supplied and falling when quantity supplied exceeds quantity demanded. The problem with this reasoning is that, in general, the demand for any good depends not just on the price of that good, but of the prices of other, perhaps many other, goods. There is therefore no guarantee that raising the price of any good in excess demand and reducing the price of any good in excess supply would cause convergence on the equilibrium price vector.

Apart from that difficulty, there is an even more serious issue: that the tâtonnement proceeds on the condition that no trade occur before the equilibrium price vector is found by the auctioneer. But the idea that such a trial-and-error process to find an unknown equilibrium price vector could take place instantaneously is clearly fantastical, no less fantastical. So tâtonnement cannot be taken seriously even as a heuristic device, as is the idea that consumption and production could be suspended pending the discovery of the equilibrium price vector.

Indeed, the obvious fact that trading constantly occurs at disequilibrium prices makes it difficult to argue plausibly, much less prove, that even absent any disturbing exogenous changes in tastes or technology, there is a reliable tendency for market prices to converge on equilibrium. In particular, trading at false (i.e., non-equilibrium) prices implies reduced output and income, which can lead to cumulative reductions in output and income. (Clower 1965, 1967, and Clower and Leijonhufvud 1981).

The lack of a plausible account of how an equilibrium price vector could ever be reached, or converged on is a serious, if not fatal, gap in the Walrasian paradigm. In the years after the publication of the seminal existence proofs of Arrow, Debreu and McKenzie, it was hoped that proofs, under plausible assumptions, of the uniqueness or stability of general equilibrium might be forthcoming, but they never materialized. On the contrary, what was proved is that neither uniqueness nor even local stability can be derived under plausible assumptions (Fisher 1983), at least using the approach advanced by Samuelson (1947) and subsequent researchers.

Given the gaps and shortcomings in the Walrasian intuition rationalizing a tendency of competitive markets to converge on general equilibrium, it might seem, and I daresay it has seemed, as if the Marshallian intuition about how individual markets tend to be equilibrated through the adjustment of market prices in response to observed differences between market demand and market supply provides a more reliable insight into the tendency market prices to converge on their equilibrium values than does the Walrasian insight. However, the idea that the Marshallian intuition is more realistic than the Walrasian intuition is clearly untenable, inasmuch as the Marshallian partial-equilibrium analysis is logically dependent on the Walrasian general-equilibrium analysis, merely being a logically derivative adaptation of Walrasian general-equilibrium analysis under a *ceteris-paribus* assumption conditional on the existence of a Walrasian equilibrium.

Just as the Walrasian paradigm does not explain how a market process converges on a general-equilibrium price vector, the Marshallian paradigm, that supposedly describes how a market process converges on a partial-equilibrium price for a single market, can do so only by positing the existence of a general-equilibrium vector of prices for goods and services aside from the single market price being explained by the partial-equilibrium analysis. The Marshallian analysis does so by taking as its starting point the assumption that the market under analysis is small enough, or disconnected enough from all other markets, that all prices but the one yet to be determined remain unaffected by the determination of that single price. Such a *ceteris-paribus* assumption can be upheld only if all other prices are already at their equilibrium levels. Unless they are, the *ceteris-paribus* assumption cannot be maintained. Thus, the Marshallian analysis is itself contingent on the assumption that a general-equilibrium price vector is -- and remains -- in place.

The logical dependence of Marshallian partial-equilibrium analysis on Walrasian general-equilibrium analysis was obscured by Marshall's mode of reasoning and his masterful exposition, drawing on vast practical and institutional knowledge of business and economic history and practice, thereby lend realism and authority to his arguments. But the pure logic of Marshallian partial equilibrium analysis cannot be divorced from that of Walrasian general-equilibrium analysis. That logical dependence was overlooked and minimized by Marshall's Cambridge successors and by his Chicago-School devotees who voiced their emphatic

preference for Marshallian partial-equilibrium theory over Walrasian general-equilibrium theory (Knight 1944, Friedman 1949) owing to the supposedly greater relevance and realism of the former than the latter.[4]

The primacy attached to price theory in its Marshallian partial-equilibrium form reflected the view that the empirical content of microeconomics stems from the comparative-statics results derived by analyzing the effect of a parametric change in an equilibrium system on a subset of variables. Normally deriving a definite empirical result requires a *ceteris-paribus* condition to be imposed (Samuelson 1947). But the underlying distinction is not between the logical structure of the theories but between the nature of the conditions imposed on the theory. Partial-equilibrium analysis applied to a single industry or market requires a *ceteris-paribus* condition to be imposed on all other markets under an assumption that the market of interest is small enough (or disconnected enough from other markets) for feedback effects from other markets to be neglected, allowing the results of the exercise to be plausibly assumed valid (Viner 1931, Silberberg and Suen, 2001).

Because an equilibrium can be characterized mathematically as the solution of a maximization problem, the second-order sign conditions of the maximization problem allow the directional change of the equilibrium values of the relevant variables associated with a parameter change to be inferred. Comparative-statics exercises are predicated on the assumption that the relevant equilibrium position is, if not unique, at least locally stable.

The presumption of comparative-statics analysis is that the difference between the endogenous variable in the two equilibria being compared can be used to predict, at least directionally, the change resulting from an exogenous change in the relevant parameter (which may or may not be a parameter under the control of a policy maker). But the logic that leads to identifying a comparative-statics exercise with the real-time effect of a parameter change is not ironclad (Fisher 1983), because comparative-statics exercises do not identify a real-time adjustment between the pre- and post-disturbance equilibria to another, but simply compare the free-standing equilibria corresponding to a posited parameter change. The possibility that a

[4] Lest this remark be taken as a criticism of Chicago School price theory or of Marshallian partial-equilibrium analysis, I hasten to point out that the remark is intended only to emphasize the need to recognize its limitations and the danger of an uncritical application of partial equilibrium techniques to situations in which its underlying ceteris paribus assumptions cannot be realistically upheld. See below.

parameter change could lead to an adjustment path that itself affects the equilibrium position toward which it leads, if at leads to an equilibrium at all, is not considered.

III The Walrasian-Marshallian Divide in Macroeconomics

The neoclassical divide between the Marshallian and Walrasian approaches was precipitated by the attack made by Keynes (1936) on those he called classical economists (which in his terminology covered both neoclassical and the earlier classical economists) and how they addressed two issues: (1) the relationship between employment and wages and (2) whether the rate of interest is governed by real or monetary forces.

Both Keynesian arguments seemed at odds with received doctrines of both classical and neoclassical theory, especially in its Marshallian version emphasizing the supply-demand analysis of market prices. In a straightforward Marshallian analysis of the labor market, the equilibrium wage is the wage that equates the amount of labor employers wish to hire with the amount that workers offer to supply. An equilibrium wage set by market forces would enable all workers willing to work at the wage to find employment, so that unemployed workers would be those unwilling to accept employment offers provided by employers that are being accepted by employed workers. Rejecting that straightforward, but simplistic, analysis, Keynes argued that at least some unemployed workers are unemployed involuntarily, inasmuch as they would be willing to accept employment on the same terms that employed workers have accepted.

The Keynesian argument denying that the rate of interest adjusts to equate savings with investment also seemed inconsistent with the standard supply-demand analysis. The rate of interest had been viewed as a market price equating borrowers' demands for, with lenders' supplies of, loanable funds. In a depression, when profitable investment opportunities are lacking, the demand for loanable funds falls, driving down the interest rate that equilibrates the supply of, with the demand for, loanable funds. But Keynes argued that the rate of interest does not fall enough to induce as much investment spending to sustain full employment, because the rate of interest does not, as the classical theory holds, adjust to equate the yield on new investment with the reward to thrift (saving), but, indeed, adjusts to equate the demand for liquidity (money) with the supply of liquidity (money). Because it is governed by the demand for

and supply of liquidity, not by supply of, and the demand for, loanable funds, the interest rate does not adjust to equalize savings and investment at a level that sustains full employment.

Although both these arguments seemed to contradict the Marshallian version of neoclassicism in which Keynes was raised and trained, and had himself deployed deftly in previous works, Keynes justified his rejection of the standard Marshallian analysis of the interest rate with a counterargument that the rate of interest represents not the price of loanable funds, but the price of liquidity. Thus, Keynes could defend his view of the interest rate with an argument that could be couched in supply-demand terms no less Marshallian than the classical view of interest that he disputed. His argument was just that it is the money-supply/money-demand relationship that determines the rate of interest not the loanable-funds-supply/loanable-funds demand relationship.[5]

Seeking to rebut the Marshallian analysis of the determination of wages and employment, but unable to make his argument within an alternative supply-demand framework, Keynes, instead, offered reasons why nominal wages might not fall in response to high unemployment, reasons that were at least similar in kind to arguments previously offered by economists to explain why wages tend to be rigid or sticky. But Keynes also offered two arguments that nominal-wage reductions, even if accepted by or forced upon workers, would not reduce unemployment. First, he argued that nominal-wage reductions would not cause real wages to fall, because wage reductions would lead to corresponding price reductions, so that real wages would not fall. Second, he introduced supervening conditions for macroeconomic equilibrium between expenditure and income, which, if not satisfied, would preclude the elimination of unemployment.

I forego any critique of Keynes's arguments concerning whether nominal-wage cuts would reduce unemployment, my chief aim being to note that Keynes's critique of nominal-wage cuts as an anti-unemployment strategy as well as his critique of the loanable-funds theory of

[5] Of course, the problem with this approach is that a) it leaves the price level undetermined, being determined under the quantity theory by the demand for and the supply of money, or in the classical theory by the value of gold (or other commodity) into which money is made convertible at a fixed rate. Keynes avoided the problem by taking the price level to be determined by the wage level and assuming that the wage level is held constant. Keynes could make this assumption, because he argued that the standard Marshallian argument that an excess supply of any good or service (including labor) required a price reduction to clear the market.

interest could have been more effectively made from the perspective of Walrasian general-equilibrium theory, inasmuch as the *ceteris paribus* conditions for a partial-equilibrium analysis of either the labor market or the determination of the rate of interest do not even come close to being satisfied.

Keynes actually seemed to be groping for such a systemic critique in discussing the effect of nominal-wage reductions, but his characteristic mode of reasoning was to consider relationships in isolation and in a linear sequence of causality rather than as a system of simultaneous determination.

Bridel (2021) has documented this explanatory inclination of Keynes in his arguments with Robertson about the theory of interest and the ensuing unproductive and unnecessary decades-long controversies about liquidity preference vs. loanable funds. Unfortunately, as Bridel recognizes, what has been gained in logical coherence by the adoption of a Walrasian general-equilibrium perspective in macroeconomics has been dissipated by the loss of empirical relevance.[6]

IV Intertemporal Equilibrium and the Explanatory Gap

Both the general-equilibrium analysis of Walras and the partial-equilibrium analysis of Marshall pertained to a single period. They understood equilibrium to be a state of rest that would not change unless and until it was disturbed by a change in the underlying data. Marshall allowed for temporary deviations from equilibrium owing to transitory deviations from the long-term conditions, but Marshall's analysis was focused primarily on the determination of long-term equilibrium.

The single-period equilibrium described by both Marshall and Walras remained the standard version of equilibrium analysis until Irving Fisher (1896) explicitly introduced a two-period model in which he could characterize the rate of interest as a rate of transformation, or exchange between current and future goods. The Fisherian notion of an intertemporal equilibrium was extended almost simultaneously by Myrdal (1927), Hayek (1928 [1984]) and

[6] Even Milton Friedman (1968), his intense Marshallian proclivities notwithstanding, ultimately conceded, however unwillingly, the logical priority of the Walrasian paradigm in putting forward his tortured definition of the natural rate of unemployment as that rate of unemployment that would be "ground out by the Walrasian equations."

Lindahl (1930 [1939]) into a more explicit conception of an intertemporal general-equilibrium than had been provided by Fisher (Glasner 2020).

The insight of Myrdal, Hayek and Lindahl was to reformulate the necessary condition for equilibrium not as a static system at rest, but as a system of consistent optimal plans formulated by individual agents for current and future consumption and production be conditioned on correctly foreseen future prices. The key distinction between the single-period equilibrium and the intertemporal equilibrium is that the former is characterized by a vector of current prices at which the optimal consumption and production decisions of all agents are mutually compatible, and the latter is characterized by a vector of current and (expected) future prices at which the optimal consumption and production plans of all agents are mutually compatible. In the absence of current markets for future transactions, intertemporal equilibrium is not possible unless all agents condition their optimal future plans to consume and produce on equilibrium expectations of the relevant future prices.

In one important respect, the MHL conceptual breakthrough from the concept of a static, stationary equilibrium, to an intertemporal dynamic equilibrium simply compounds the problem that Marshall and Walras left unresolved: how prices reach their equilibrium values. Without such an explanation, there is no theoretical basis on which to assert that there is any tendency toward to equilibrium. The difficulty is compounded in an intertemporal context, because a systemic tendency toward equilibrium requires not only that current prices converge on equilibrium values in all current markets, but that the expectations (held by all agents) of all future prices also converge on equilibrium values. Without a complete set of current markets for in which future prices are determined, the unconstrained adjustment of prices in response to excess demands or supplies to eliminate those excess demands and supplies in the existing current markets does not imply intertemporal equilibrium unless expectations of future prices are also at their equilibrium values. But without a complete set of current markets in which future prices are determined, there is no market mechanism that causes expectations to converge on their equilibrium values. sufficient to (Hayek 1937).

Although it compounds the problem of accounting for even a weak tendency toward equilibrium, the shift from a static-equilibrium conception to an intertemporal-equilibrium conception may help us account, at least under some conditions, for such a tendency. Before

trying to indicate the nature of such a tendency, I want first to indicate why I believe that it is from the work of Menger, rather than either Walras or Marshall, that we can gain insight into such a tendency.

V The Mengerian Origins of Intertemporal Equilibrium

As noted above, the originators of the concept of intertemporal equilibrium were Myrdal, Lindahl (two Swedes) and Hayek (an Austrian). It seems unlikely that it was merely coincidental that the idea of intertemporal equilibrium was first explicated by three economists who were directly or indirectly influenced by Carl Menger. Hayek (1970, 12), himself alluded to the connection in his centennial retrospective on the influence of Menger.

> [I]f in consequence the spreading and development of his theories was left almost wholly to the younger members of the Austrian School, there can be little doubt that during the fifty years from the mid 80s of the last century to the mid 30s of this they had, at least outside Britain where Alfred Marshall's ideas dominated, the greatest influence on the development on what . . . is now usually called neo-classical economics. For this we have the testimony of Knut Wicksell (1921), who was probably the best qualified judge because he was equally familiar with all the different strands of marginal theory, and who, in 1921 in an obituary of Carl Menger, could write that "no book since Ricardo's Principles has had such a great influence on the development of economics as Menger's *Grundsätze*.

Menger's influence on the originators of the intertemporal-equilibrium concept is not merely that they were introduced to the concept of marginal utility by reading either Menger's work or those of his disciples Böhm-Bawerk and Wieser and perhaps also those of Wicksell. It was a particular aspect of Menger's work, absent from the expositions of either Walras or Marshall, that lent itself to the idea of intertemporal equilibrium. That aspect was Menger's distinction between goods of lower and higher orders, lower orders signifying greater closeness to the form in which goods are sold to end-users. The value of goods of lowest order, determined

by the marginal utility of those goods to consumers,[7] is what imparts value to goods of higher order, which as yet provide no utility to (satisfy no needs or wants of) consumers.

Two important insights underpin Menger's application of marginal analysis. First, he recognized that it is the value of final (first-order) goods that is imputed to inputs not, as the classical economists believed, the value of inputs that is somehow transmitted to the outputs that they produce. The insight disposes of the notion, never relinquished by Marshall, that cost is an independent determinant of price rather than a reflection of the value of the output foregone to produce that which is produced; cost is ultimately, and in equilibrium, to use Menger's formulation, the most valuable need or desire still not satisfied as a result of producing something else. But in equilibrium the value of the least valuable satisfied want and the most valuable unsatisfied want are equal.

Second, and more directly relevant to the understanding of intertemporal equilibrium, Menger attributes the value of inputs not to the actual, known, value of what those inputs produce, but to the subjective estimates made by those purchasing or hiring the inputs of how much value will be attributable to the contribution of those inputs to the output (of uncertain value) that the production processes in which those inputs are deployed will eventually bring forth.

Thus, Menger recognized that input prices depend on output prices *expected*, but not realized until after commitments to hire or purchase inputs are made. In the Walrasian general-equilibrium and Marshallian partial-equilibrium treatments in which inputs are purchased and outputs produced either simultaneously, or at least within a single period, the correspondence between the value of inputs and the value of outputs is embedded into the equilibrium framework of their analysis.[8] However, Menger took explicit account of the potential for entrepreneurial

[7] The term "marginal utility" was never used by Menger. Instead, he described the cognate concept of the most important unsatisfied need that would be satisfied if the good were available for consumption. The subjective valuation of satisfying that unmet need determines the value of the first-order good. Higher-order goods, which are transformed into lower order goods, derive their value from the expectation of the value of the lower-order good when it reaches the market less the value of whatever complementary inputs are required to transform the higher-order good into a lower-order good discounted into the present.

[8] Because factor prices are taken as given in conventional partial-equilibrium analysis, Marshall could easily assume that cost can be taken as an independent determinant of the price of the product analyzed in a partial-equilibrium context. Without the *ceteris-paribus* assumption that fixes input prices, Marshallian partial-equilibrium analysis is not possible.

expectations about the value of the output generated by inputs purchased or hired to be mistaken. But from Menger's starting point, an explicit recognition that expectations of future prices are merely conjectural and potentially erroneous, it followed naturally that, for a state of equilibrium to be possible, those expectations of future prices by all agents must be correct.

While the Walrasian and Marshallian branches of neoclassical economics framed equilibrium analysis in terms of a single period (of unspecified duration), the Mengerian branch emphasized the sequential and interconnected temporal nature of economic decisions. The Austrian attention to capital theory and the attempt of Austrian business-cycle theory to incorporate that capital theory into its analysis of economic fluctuations is therefore unsurprising and, even if the attempt, in many respects, turned out to be unsuccessful, commendable.

VI The Explanatory Gap and Mengerian Subjectivism

The explanatory gap that neither the Marshallian nor the Walrasian versions of equilibrium analysis have been able to bridge is how the equilibrium state that they describe, but whose existence is crucial for such empirical content as can be claimed on behalf of those versions of neoclassical theory, could ever come about. That equilibrium is defined in terms of a set of prices prevailing in a single period.

The single-period equilibrium has been extended, at least in a formal way, in the standard Arrow-Debreu-McKenzie (ADM) version of the Walrasian equilibrium, but this version is in important respects just an enhanced version of a single-period model, inasmuch as all trades take place at time zero in a complete array of future state-contingent markets, rather than a truly intertemporal model in which the future unfolds in potentially surprising ways as opposed to executing a set of consistent plans to produce, purchase and sell in a sequence of predetermined actions (Glasner 2021).

Under assumptions less extreme than those of the ADM model, an intertemporal equilibrium is a vector of current prices and expectations of future prices at their equilibrium levels, and just as equilibrium current prices are the same for all agents, the expectations of equilibrium future prices must be the same for all agents. In the single-period equilibrium, all agents share common knowledge of equilibrium prices of all commodities (though it is just assumed that, not shown how, this knowledge is transmitted to all agents). But in intertemporal

equilibrium (for purposes of this discussion the ADM model does not qualify as an intertemporal equilibrium), agents, lacking common knowledge of future prices, can only make guesses (form expectations) about future prices derived from a subset of current markets for future delivery in which future prices are determined and from their own stocks of private knowledge.

If the knowledge on which agents rely to make plans consists common knowledge shared by all, it may be plausible to assume that they will rationally arrive at similar expectations of the future prices. But if the stock of knowledge on which agents rely consists of both common knowledge and private knowledge, then, there being no market mechanism that tends to equalize agents' expectations of future prices, it seems unlikely that the price expectations of different agents will come into accord. Nevertheless, though unlikely, it is not necessarily inconceivable, that agents would all arrive at the same expectations of future prices.

However, the rational-expectations movement that began to transform macroeconomics in the 1970s has imposed as a methodological imperative required by the neoclassical axiom that all agents are rational optimizers that all agents share the same expectations of future prices implied by the relevant general-equilibrium model (presumably the ADM model). Accordingly, just twenty years after Arrow called attention to the explanatory gap in neoclassical theory by observing that neoclassical theory provides no explanation of how competitive prices can change, Paul Milgrom and Nancy Stokey (1982) turned Arrow's argument on its head by arguing that, under rational expectations, trading would never occur at disequilibrium prices, because every potential trader, realizing that no offer to trade at disequilibrium prices would be made unless it was based on private knowledge, would refuse such an offer. Because rational traders would never agree to trade at a disequilibrium price, there would be no incentive to seek or exploit private information, and trading at disequilibrium prices would never occur.[9]

This would have been a profound and important argument had it been made as a *reductio ad absurdum* to show the untenability of the rational-expectations as a theory of expectation formation, inasmuch as it leads to the obviously false factual implication that private information is never valuable and that no profitable trades are made by those possessing private information.

[9] Milgrom and Stokey rejected Hirshleifer's (1971) argument about inefficient incentives to devote resources to gaining private knowledge to use in trading with less-informed agents.

In concluding their paper, Milgrom and Stokey acknowledged the troubling implication of their argument:

> Our results concerning rational expectations market equilibria raise anew the disturbing questions expressed by Beja (1977), Grossman and Stiglitz (1980), and Tirole (1980): Why do traders bother to gather information if they cannot profit from it? How does information come to be reflected in prices if informed traders do not trade or if they ignore their private information in making inferences? These questions can be answered satisfactorily only in the context of models of the price formation process; and our central result, the no-trade theorem, applies to all such models when rational expectations are assumed.

What Milgrom and Stokey seem to have overlooked is that the rational-expectations assumption dispenses with the need for a theory of price formation, inasmuch as every agent is assumed to be able to calculate what the equilibrium price is. They attempt to mitigate the extreme nature of this assumption by arguing that by observing price changes, traders can infer what changes in common knowledge would have implied the observed changes. However, that argument seems insufficient, because any given change in price could be caused by more than one potential cause. As Scott Sumner has often argued, one can't reason from a price change. Only if one has independent knowledge of the cause of the price change, is it possible to use the price change as a basis for further inference.

Rational expectations, as I have argued previously (Glasner 2020), is not a property of individual agents making rational and efficient use of any information that they obtain; it is a property of intertemporal equilibrium. Rational expectations in the technical sense that agents can correctly foresee future prices is conditional on all agents foreseeing the same prices. If even one agent does not foresee future price correctly, none of them will. Just as the fact that the sum of the three angles in a triangle equals 180 degrees is a property of the triangle correct expectations of future prices is property of equilibrium. That does not mean that the agents are possessed of the power to calculate equilibrium prices or even to know if their expectations of future prices are equilibrium expectations. (See Blume, L., Curry, T., and Easley, D., 2006)

Rational-expectations theorist provide no explanation of how or why agents should hold the same expectations other than the question-begging assertion that the rationality assumption requires that rational agents should arrive at identical expectations.

It is noteworthy that Hayek (1937) explicitly conceded the absence of a theoretical explanation for any tendency toward intertemporal equilibrium, and instead merely (and in 1937!) invoked an empirical tendency of economies to move in the direction of equilibrium as a justification for considering economic theory to have any practical relevance.[10]

VII Franklin Fisher on the Disequilibrium Foundations of Economics

Acutely aware of the explanatory gap that compromises standard neoclassical theory in both its Marshallian or Walrasian versions, F. M. Fisher (1983) suggested an alternative approach to the conventional analysis of the stability properties of neoclassical models based on a tâttonement process in which all trading occurs at disequilibrium prices, the conventional analysis having failed to prove stability under the standard neoclassical assumptions about tastes and technology under which the existence of equilibrium is proved.

Abandoning the assumption that no trade occurs at disequilibrium prices, Fisher suggested trying, instead, to prove stability while allowing trade to occur at disequilibrium prices under the "no favorable surprises" assumption previously advanced by Hahn (1978) to derive stability results. Fisher derived stability results using the NFS assumption and the assumption that arbitrage would ensure that all unsatisfied transactors in any market in disequilibrium would be on the same side of the market -- either unsatisfied demanders or unsatisfied suppliers, but never on both sides of a single market -- to show that the standard assumption of raising prices in markets with excess demand and reducing prices in markets with excess supply would converge on an equilibrium price vector. The result hinged on the idea that, with no favorable surprises,

[10] In his centenary retrospective on Menger's contribution, Hayek (1970), commenting on the inexactness of Menger's account of economic theory, focused on Menger's reluctance to embrace mathematics as an expository medium with which to articulate economic-theoretical concepts. While this may have been an aspect of Menger's dismissal of mathematical reasoning, his recognition that expectations of the future are inherently inexact and conjectural and more akin to a range of potential outcomes of different probability may have been an even more significant factor in how Menger chose articulate his theoretical vision.

the aggregate target utility of all transactors would decline consistently as price adjustments were made, thereby satisfying the conditions for a converging Lyapunov process.

The Fisher-Hahn NFS assumption has been criticized for being ad hoc could not be deduced from fundamental properties of the agents or from the trading and production technologies characterizing the system. But a deeper problem with Fisher's approach is that it fails to reckon with the need for equilibrating adjustments, not only in actual prices for current transactions, but also for equilibrating adjustments in agents' expectations of future prices on which their current plans to purchase and sell are based. There is no feedback to disequilibrium expectations of future prices corresponding to the feedback on disequilibrium current prices from current excess supplies or excess demands, which are themselves functions not only of current, but of expected future, prices.

Despite that gap in Fisher's approach, the Fisher-Hahn NFS assumption seems plausible when the position of the economy after a disturbance is in the neighborhood of a post-disturbance equilibrium to which the system would be attracted if the price vector consistent with the post-disturbance equilibrium were established. Because every Pareto-optimal equilibrium can be characterized as a utility-maximum, the closer the post-disturbance position of the economy is to a new Pareto-optimum equilibrium, the more likely it is that the Fisher-Hahn NFS assumption would hold.

But if the disturbance is powerful enough to move the economy far away from the old Pareto-optimum equilibrium or to a new one, the NFS assumption seems problematic. Once the economy is displaced from an equilibrium position, the further away it is from a new equilibrium, the more likely it seems that adjustments in prices could lead to favorable surprises that, under Fisher's approach, reduce the likelihood that changing prices based on whether markets are in excess demand or excess supply will result in convergence on an equilibrium price vector.

It appears to me that the Lipsey-Lancaster (1956) second-best theorem raises the same or very similar doubts about the NFS assumption. According to the second-best theorem, if one optimality condition in an economic model cannot be satisfied, it is possible that the next-best solution requires that other variables be changed away from the values that would otherwise be optimal. Thus, changes affecting one market may well lead to favorable surprises in other

markets. The greater the change affecting one market, the greater the likelihood that the new equilibrium will involve favorable surprises in one or more other markets.

If I am correct in my interpretation of the NFS assumption, Fisher's stability results would provide some support for the suggestion of Leijonhufvud (1973) that there is a corridor of stability around an equilibrium time path within which an economy, under normal circumstances will not fall too far below the path, and, if not displaced too far below the path, will normally, more or less on its own, move toward its equilibrium path unless exogenous disturbances drive it further from the equilibrium path.[11]

Leijonhufvud attributed such resilience to the holding of buffer stocks of inventories, cash, credit lines, that enable agents to continue normal operations despite temporary disappointment of expectations. If negative surprises are persist, agents will not be able to add to inventories indefinitely or finance normal expenditures by borrowing or drawing from liquid assets or borrowing. Once such temporary buffer stocks are exhausted, the stabilizing properties of the economy overwhelmed by the destabilizing tendencies, the expenditures of income-constrained agents must be cut in line with the traditional Keynesian multiplier analysis triggering a cumulative contraction, and, without extraordinary fiscal or monetary measures, a spontaneous recovery is no longer possible.

There is no clear and direct connection between Leijohnhufvud's conjecture of a corridor and my interpretation of Fisher's stability argument, but I think there is enough similarity to be worthy of further inquiry.

VIII A Mengerian Neoclassical Synthesis

The rational-expectations postulate that now characterizes neoclassical macroeconomists -- that all agents share the same forecasts of equilibrium prices, so that the economy always operates in a state of general equilibrium – cannot, in my view, be justified theoretically or defended empirically. Nevertheless, by methodological fiat, it has been accepted by – or forced

[11] Presumably because the income and output are maximized at the equilibrium path, it is unlikely that an economy will overshoot the path unless entrepreneurial or policy error cause such overshooting which is presumably an unlikely occurrence, although Austrian business cycle theory and perhaps certain other monetary business cycle theories suggest that such overshooting is not or has not always been an uncommon event.

upon – the profession as a question-begging response to Arrow's explanatory gap concerning the inability of the neoclassical competitive model to account for price adjustment.

And yet, I believe that the rational-expectations movement did, unintentionally, perform a service by focusing on expectations as the key to filling the explanatory gap. However, a similar, but more useful, suggestion was made independently about the same time by Fischer Black (2010) in his early anti-Monetarist papers. When Black wrote those papers, they did not attract much attention, because his argument implied (or at least seemed to imply) that monetary policy did not affect, and could not control, inflation. Black argued that without convertibility of money into a real good, the equilibrium price level and rate of inflation in a standard equilibrium model are theoretically indeterminate, so that it is expectations that determine what the actual rate of inflation turns out to be. Of course, if heterogeneous agents have divergent expectations of inflation, it is not clear what rate of inflation is implied by any particular set of inflation expectations across agents.

Although Black argued that business cycles should be viewed as equilibrium phenomena, and that expected outcomes tend to be actual outcomes, he was not a rational-expectations theorist of the same ilk as Lucas or Milgrom and Stokey, because he did not believe that all individuals hold the same expectations or that the only knowledge on which people base their decisions is common knowledge.

I therefore believe that Black's view of expectations was more likely in line with the subjectivism of Carl Menger than with the simplistic rational-expectations view of Lucas et al. Individuals rely on many sources of information, and not all those sources are public or common knowledge. Even public information is not equally accessible to all and distilling and interpreting that information from many sources, public or private, is costly. Because of the costs of acquiring information (which are undoubtedly characterized over a significant range by economies of scale) are very different for some agents than for others, there is every reason to believe that some agents – let us call them specialists -- are better informed than others. Thus, the natural Mengerian assumption is that market specialists develop expectations based on their private and public sources of information which, through experience, they have grown

accustomed to interpret and assess. However, specialists tend to specialize in particular markets or sectors of the economy, so that no agents are specialists across all markets and sectors.[12]

Because of pervasive information differences across agents, there is no reason to expect, or to assume, the subjective expectations of agents to be the same or for prices in a particular market to always be uniform. Observed price differences can therefore be attributed to differences in information and in expectations of future prices.

In the absence of an auctioneer, there is no uniform method for announcing or posting or agreeing on what the price is for any given transaction. How prices are posted varies across markets. It is market specialists who have the best information about market conditions, so they are the ones that post or announce the prices at which transactions are made. Often it is sellers that post the prices at which they will sell, but sometimes it is buyers that post the prices at which they will buy. In other markets, prices are determined by separate negotiations between pairs of buyers and sellers, while in other markets, prices are determined in some organized fashion by market makers (middlemen), or in auction-like settings.

One way to think about the process by which prices change is to assume that prices remain constant until one or more agents expect the price of a particular asset, good or service to change in the future. For purposes of this discussion, I assume that the agents that set prices are the sellers in transactions between firms, and by firms in transactions with households supplying labor services. I also assume that all firms believe that they are price-takers in the sense that no firm believes it can profitably post a price higher than the prices posted by its competitors. However, lacking perfect information about the prices posted by their competitors, competing firms may post different selling prices for closely competing products and it is left to customers or arbitrageurs to discover these differences restore price uniformity.

[12] Nor is the social value of information as great as the private value of information, because much of the value of information is results from the ability to underpay now for resources that will increase in value in the future irrespective of who owns the resource (Hirshleifer, 1971). Hence the private incentive to make costly efforts to acquire information exceeds its social value.

Thus, when one firm, expecting a future increase in the price of the product it sells, raises its price, it does so on the assumption that its competitors will also (and independently[13]) raise their prices. However, at any moment, the firm does not know what price its competitors are posting. When its competitors learn that the firm has raised its price, those firms will take that new knowledge into consideration when deciding whether to raise their prices, keep them constant, or reduce their prices, in response. Presumably, if those firms agree with the first firm that the future price will increase, they will interpret the price increase as confirmation of their own expectation and likely increase their price as well. If there are firms that hold and maintain a different expectation about the future price, they will not raise their price, and the price difference, depending on its size, may persist for a time if neither arbitrage nor competitive switching by customers to the lower priced suppliers forces the higher-priced suppliers to rescind their price increase,

Whether the price increase of any firm is sustainable will depend, in the first instance, on whether its competitors have similar expectations. If they do, they will all increase their prices and the price increase will be sustained at least temporarily. Whether the price increase is sustainable in the longer term will depend on whether the information underlying the expectation of a future price increase will be validated. If the information turns out to have been incorrect or is superseded by further new information that points toward a price reduction or a smaller price increase, the price increase will be rescinded in full or in part.

Thus, in the Mengerian world agents are constantly acquiring new information about the markets with which they have direct or indirect connection and use the new information to update their beliefs and expectations about the future prices of outputs they produce or sell and about the inputs that they purchase or hire in producing and distributing their outputs. Updated information causes different agents to revise their expectations of the prices at which they will purchase, hire or sell and their plans about how much to purchase or sell or produce. Changes in expectations lead to changes in prices and changes in plans which in turn lead to further changes in information and expectations and so on.

[13] In other words, the firm raising price is not doing so to signal to its competitors that all firms should collude to increase their price, rather it is acting on an its assessment that market conditions will change in a way that will raise the equilibrium market price.

This is the sort of churn and price adjustment that characterizes markets in normal times, when the market system as a whole is functioning more or less normally. Market specialists use the market information derived from familiar and reliable sources and based on that information, they are able to forecast future prices with some, albeit imperfect, accuracy. The perspective of market specialists is akin to the perspective of Marshallian partial-equilibrium which focuses on information relevant to a specific market, or, at most, to a sector of vertically and horizontally related markets.[14]

However, because no sector is shielded against effects and disturbances emanating from other sectors or from the state of the macro-economy as a whole, the partial-equilibrium perspective of market specialists will sometimes fail to anticipate shocks emanating from outside their normal perspective. Anticipating shocks from sectors not in their usual bailiwick and then guessing how such shocks might affect the market or sector of primary interest to the specialist is hardly likely to be a skill that most well-informed market specialists have perfected. Yet it is just such a skill that market specialists would require to be able to anticipate the consequences that rational expectations theorists routinely assume that market participants possess. And for their macroeconomic view to be correct, it would not be sufficient for some specialists to have such ability, because all market expectations have to correctly forecast future prices for rational expectations to make any sense.

A strict rational-expectations approach to macroeconomics and business cycles, either New Classical theory, Real-Business-Cycle theory, or New-Keynesian theory, requires unreasonable and counterfactual assumptions about the common knowledge possessed by agents and their capacity to use that knowledge to anticipate future prices upon which the consistency of their optimal consumption and production plans are based. Absent such consistency, the possibility of coordination failures, disequilibrium, involuntary unemployment cannot be

[14] It is noteworthy that the original paper by Muth (1961) from which Lucas took the idea of rational expectations as an empirical hypothesis about expectation formation was partial-equilibrium analysis of price dynamics in commodity markets supposedly driven by the cobweb (or corn-hog) cycle in which supposedly agricultural producers operating with a long lag between planting and harvest who base their planting decisions on the current price of the product rather than the expected future price of the product would chronically alternate between high and low prices and underproduction and overproduction. Muth found that such markets are in fact less cyclical than the cobweb model predicts because suppliers do take rationally expected future prices into consideration in their planting decisions.

dismissed by a priori methodological postulates that define such categories as violations of the basic concepts of economic theory and pre- or pseudo-scientific nonsense.

IX Conclusion

Mengerian subjectivism suggests an alternative approach to the dominant contemporary version of neoclassical macroeconomic theory that tries to understand how, and under what conditions, individuals that don't share the same stock of common knowledge can ever arrive at a state of equilibrium in which the plans that they construct based on their differing stocks of knowledge may still be sufficiently compatible to allow them to execute their own plans with some reasonable likelihood of success. This is a formidable research project, which as yet, has yielded very meager results, but which deserves the attention of serious students of macroeconomics.

Working within the Mengerian tradition, Israel Kirzner has already insightfully called attention to the market process that at least exhibits a tendency toward equilibrium, even though the destination is never reached. He attributes that tendency to what he calls entrepreneurial alertness. If I am adding anything to Kirzner's articulation, it is a focus on the formation of the price expectations on which economic agents rely in formulating their plans for their consumption and production and purchases and sales over time. The substantive issue on which I may take issue with Kirzner is that I believe that his assumption that entrepreneurial alertness is equilibrating, rather than potentially disequilibrating, is not always or necessarily valid. At a minimum, the assumption is simply an empirical conjecture for which there is no theoretical basis inasmuch as there is no explanation of how, or why, the expectations held by different individuals relying on disparate stocks of common and private knowledge should ever, except by chance, come into sufficient correspondence to provide the basis for an intertemporal equilibrium of the sort described by Hayek, Myrdal, Lindahl, Hicks and Radner.

References

Arrow, K. J. 1959. “Toward a Theory of Price Adjustment.” In M. Abramowitz (ed.) *The Allocation of Economic Resources*. Stanford: Stanford University Press.

Black, F. 2009. *Business Cycles and Equilibrium*. New York: Wiley

Blume, L., Curry, T. and Easley, D. 2006. “Information, Trade and Incomplete Markets.” Economic Theory 29(2):379-94.

Böhm-Bawerk, E. v. 1891. *The Positive Theory of Capital*. London: Macmillan.

Bridel, P. 2021. “The Part Played by General Equilibrium in the Liquidity Preference vs Loanable Funds Episode (1936-1956).” *The European Journal of the History of Economic Thought*, 28(5): 753-86

Clower, R. 1965. “The Keynesian Counterrevolution: A Theoretical Appraisal.” In F. H. Hahn and F. P. R. Brechling (eds.) *The Theory of Interest Rates*, 103-25. London: Macmillan

Debreu, G. 1959. *The Theory of Value*. London: Wiley/

Fisher, F. M. 1983. *Disequilibrium Foundations of Equilibrium Economics*. Cambridge: Cambridge University Press.

Fisher, I. 1896. *Appreciation and Interest*. New York: Macmillan.

Friedman, M. 1949. “The Marshallian Demand Curve.” *Journal of Political Economy* 57(6): 463-95.

Friedman, M. 1968. “The Role of Monetary Policy.” *American Economic Review*. 58(1): 1-19.

Glasner, D. 2020. “Hayek, Hicks, Radner and four equilibrium concepts: Perfect foresight, sequential, temporary, and rational expectations.” *Review of Austrian Econ*omics.

Hahn, F. H. 1978. “On Non-Walrasian Equilibria.” *Review of Economic Studies* 45(1): 1-17.

Hayek, F. A. 1928 [1984]. “The Intertemporal Price Equilibrium and Movements in the Value of Money, in R. McCloughry (ed). *Money, Capital and Fluctuations: Early Essays*, 171-215. Chicago: University of Chicago Press, pp. 171-215.

Hayek, F. A. 1937. “Economics and Knowledge.” *Economica* n.s. 4(1): 33-54.

Hayek, F. A. 1970. “The Place of Menger’s *Grundsätze* in the History of Economic Thought.” In J. R. Hicks and W. Weber (eds.) *Carl Menger and the Austrian School of Economics*, 1-14. Oxford: Clarendon Press.

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

Jaffé, W. 1981. “Another Look at Walras’s Theory of Tâtonnement.” *History of Political Economy* 13(3): 313-36.

Jevons, W. S. 1871. *The Theory of Political Economy*. London: Macmillan.

Keynes, J. M. 1936. *The General Theory of Employment, Interest and Money*. London: Macmillan.

Kirzner, I. M. 1997. "Entrepreneurial Discovery and the Competitive Market Process." *Journal of Economic Literature* 35(1): 60-85.

Knight, F. H. 1944. "Realism and Relevance." *Journal of Political Economy* 52(4): 289-318.

Leijonhufvud, A. 1973. "Effective Demand Failures." *Swedish Journal of Economics* 75(1): 27-48.

Lipsey, R. G., and Lancaster, K. 1956. "The General Theory of Second Best." *Review of Economic Studies* 24(1):11-32.

Lindahl, E. 1930 [1939]. "The Rate of Interest and the Price Level," in *Studies in the Theory of Money and Capital*. London: George, Allen & Unwin.

Marshall, A. 1890. *Principles of Economics*. London: Macmillan.

McKenzie, L. M. 1954. "On Equilibrium in Graham's Model of World Trade and Other Competitive Systems." *Econometrica* 22(2):147-61.

Menger, C. 1871. *Grundsätze der Volkswirtschaftslehre.* Wien: Wilhelm Bramuller.

Milgrom, P and Stokey, N. 1982. "Information, Trade and Common Knowledge." *Journal of Economic Theory* 26(1): 17-27.

Myrdal, G. 1927. *Prisbildningsproblemet och Foranderligheten* (Price Formation and the Change Factor). Stockholm: Almqvist & Wicksell.

Pareto, V. 1909. *Manuel d'économie politique*. Paris. Girard.

Samuelson, P. A. 1947. *The Foundations of Economics*. Cambridge: Harvard University Press.

Silberberg, E and Suen, W. 2001. *The Structure of Economics: A Mathematical Analysis*. New York: McGraw-Hill

Viner, J. 1937. *Studies in the Theory of International Trade*. New York: Harper.

Wald, A. 1936 [1951]. "On Some Systems of Equations in Mathematical Economics." *Econometrica* 19(4): 368-403.

Walras, L. 1874. Éléments d'économie politique pure. Lausanne: Corbaz.

Wicksell, K. 1921. "Carl Menger." *Ekonomisk Tidskrift*, *23*(4/5), 113–18.

Wieser, F. v. 1893. *Theory of Natural Value*.