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ECONOMIC CALCULATION UNDER SOCIALISM:
THE AUSTRIAN CONTRIBUTION

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Economic theories of socialism during the 1930's were based on Walrasian general equilibrium models in which the central planning board was to function as the auctioneer. Socialists assumed that "market socialism" would achieve all the efficiencies characteristic of perfect competition while avoiding the serious market failures of real capitalist economies. The Austrians, Ludwig von Mises and Friedrich Hayek, argued that even market socialism would fail to achieve the efficiency of real market capitalism because Walrasian models used to construct the economic theory of socialism left out important features of real markets that generate efficient outcomes. Specifically, the entrepreneurial nature of the adjustment process, the importance of decentralized information and the role of incentives under varying institutional settings.

Between 1920 and 1940, a body of economic literature developed which became known as the debate over economic calculation under socialism. It began with the publication of Ludwig von Mises' article, "Economic Calculation in the Socialist Commonwealth," it took form first primarily in the German literature and then reached full flower in English language journals and books during the 1930's. The ostensible subject of the debate was whether it was possible for a real economy to operate efficiently without free markets and without private ownership of capital and land, but at the core of the debate were issues that were far-reaching and profound in their implications for economic theory in general. That the issues involved are still some of the most difficult in contemporary economic theory and remain unresolved almost forty years after the conclusion of the debate makes the identification of the differences between the two sides of more than historical interest.

It is indicative of the nature of the controversy that those who argued most effectively in favor of socialism were not advocates of a labor economists operating within the dominant neo-classical paradigm. A few

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1. Mises, (1920).
2. The people most responsible for developing the economic theory of socialism and who are referred to here are Fred Taylor, H. D. Dickinson, Oskar Lange, Abba Lerner, E. M. F. Durbin and Maurice Dobb. While many other economists wrote on the economics of socialism, these were the most influential writers on the subject and the ones whose work was accepted as a refutation of Mises.

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took their inspiration from Marshall, more from Walras, but all agreed that given some "just" initial wealth distribution, equilibrium in the perfectly competitive model represented the maximization of human welfare, and all their programs for socialism were designed to reproduce the conclusions of perfect competition in a centrally directed economy. They preferred socialism to capitalism because they believed under socialism it would be possible to eliminate the imperfections that they found existing simultaneously with free markets: monopolies, externalities, business cycles, and unjust income and wealth distributions. Thus, they believed that capitalism was undesirable because it did not measure up to the ideal or perfect competition.

Those most closely associated with the theoretical defense of capitalism, on the other hand, were Ludwig von Mises, Friedrich Hayek and Lionel Robbins. Of the three, Mises and Hayek were both Austrian economists, and Robbins, although English, was much influenced by Carl Menger and was, therefore, at least partly in the Austrian tradition. As Austrians, they worked with a perception of economic activity that differed markedly from that mainstream economists. Primarily, they questioned the relevance and applicability of static equilibrium models in which all information is given, and emphasized instead the process by which decentralized economic actors operating in a world of uncertainty

3. The exception was Maurice Dobb who was far more Marxist than the others and who challenged the "sacredness of consumer preferences" (1933, p. 591) and who argued that reproducing the conclusions of perfect competition under socialism missed the point. As he put it, "Either planning means overriding the autonomy of private decisions or it apparently means nothing at all." (1937, p. 279).

4. A belief in the superiority of socialism over capitalism both as it exists and as it is described in ideal models is implicit in all the socialists writings, but the best specific statement is found in Lange, (1962) Part IV, p. 98-120, "The Economist's Case for Socialism." There he claims that "only a socialist economy can distribute incomes so as to attain the maximum social welfare," (p. 99). In regard to externalities, a socialist economy would be able to "take into the cost accounts all the alternatives sacrificed ... by doing so it would avoid much of the social waste connected with private enterprise." (p. 104). He further asserts that "as a result of the possibility of taking into account all the alternatives a socialist economy would not be subject to the fluctuations of the business cycle." (p. 105). See also Dickinson (1933, p. 247).

5. I will use the terms "socialism" and "capitalism" to designate the opposing economic systems under debate. Although the words have no clearly recognized scientific definition (and even to the participants in the debate, the meanings shifted frequently between theoretical and empirical states), I will try to be consistent with the following meanings. Socialism will refer to any theoretical model which provides for collective ownership of land and capital goods and which designates some kind of planning board to oversee resource allocation and set official policy for capital accumulation and growth. This is a loose enough definition to encompass all the systems proposed by socialist economists during the debate. Capitalism will mean a theoretical model where all resources are privately owned and where resource allocation, consumption patterns and capital accumulation are all determined by the coordination of individual preferences in unregulated markets. This definition seems closest to what Mises and Hayek had in mind when they talked about capitalism and capitalist methods of production.

6. Although he has not received nearly the publicity the others have, we should also include Hawtry in this list. In The Economic Problem (1926) he described a socialist model which closely resembled that developed by Dickinson and Lange a decade later and criticized it along much the same lines as Hayek criticized the later ones in 1935 and 1940. See especially pp. 336-340.
and constant change bring about the coordination of production and consumption plans. Consequently, the debate was a contest of theoretical models in which a mutually satisfactory resolution was precluded from the outset.

Although it is conventional to treat the economic calculation controversy as a debate between those who favored socialism and those who opposed it, this is not descriptive of the actual course of events. During the 1920’s there was a genuine debate between Mises and the German and Austrian socialists, but by the 1930’s, Mises had finished with the issue and it was Friedrich Hayek who took upon himself the role of critic of socialism in England. However, by that time, the real debate, in so far as one took place in the journals, was among the socialists themselves who were busy hammering out a complete economic theory of socialism based on neo-classical static equilibrium analysis. Occasionally, Hayek’s criticisms were noted in scholarly articles, but rarely for any purpose other than refutation. Mostly, Mises was ridiculed, and Hayek, on this issue seen as little more than Mises’ apologist, was ignored. The unhappy result of this failure to see more than warmed over Mises in Hayek’s work was an almost total lack of recognition of the subtleties of the issues Hayek raised in criticism of market socialism. If I had to offer a crude synopsis of the economic calculation debate, it would be this: Mises wrote an article claiming that rational economic calculation was impossible under socialism. This prompted those who favored socialism to try to refute him and thus forced them to construct a model of rationally administered centrally directed economy. Meanwhile, Hayek wrote two sophisticated and penetrating critiques of the socialist schemes which were in the main ignored. Mises seemed easy to refute, and so for twenty years, socialists continued to refute the same arguments, thereby avoiding consideration of the more difficult issues raised by Hayek.

In order to understand the principal issues raised in the literature on socialist economic calculation, it will be convenient to divide my discussion into four parts. The first part of this paper examines Mises’ 1920 article to identify the sources of controversy, the second part briefly outlines the major developments in the economic theory of socialism during the 1930’s, the third part presents Hayek’s criticisms of socialist economic programs, and the fourth and final part attempts to summarize the theoretical problems raised during the debate in order to appreciate the relevance of the Austrian contribution to current problems in economic theory.

7. For instance, Dickinson’s 1933 article drew sharp criticism from Maurice Dobb (1935). Dobb’s criticism of Dickinson brought a stinging rebuke from Abba Lerner (1935). Lange managed to get by pretty much unscathed by his fellow socialists, but Durbin and Lerner had a somewhat hostile interchange on the subject of Durbin’s 1936 article (Lerner (1937), Durbin (1937) and Lerner (1938)).
The literature on the economics of socialism before 1920 is sparse. While there was no lack of scholarly (and not so scholarly) discussion of socialism as a social theory, Marxists, following the lead of Marx himself, paid little attention to the actual workings of a socialist economy. It was assumed that after the revolution was time enough to worry about the economic problem, assuming that one still existed after the demise of capitalism. A few attempts were made to describe a theory of a centrally directed economy, but these attempts were significantly made by non-Marxist economists interested in a purely theoretical problem. F. von Weiser often made use of the construct of a centrally directed economy in explicating his economic theories, as did Pareto in his exposition of general equilibrium theory. Enrico Barone developed the most complete exploration into the economics of socialism applying neo-classical tools to the problem of a centrally directed economy in an article written in 1908. None of these writers, however, were socialists and none were attempting to prescribe a formula for running a real socialist economy. More significantly, none of these efforts had any influence on socialists and Marxists prior to 1920.

What all of these early attempts to construct a theoretical model of a centrally directed economy had in common was the realization that the same economic logic can be applied both to capitalism and socialism. Therefore, if socialist economic planners want to allocate resources efficiently, they must be able to calculate correct resource and product values, including those two much despised by Marxists, interest and profits. Hence, in 1920, in a manner which suggested growing impatience with economically naive Marxists (some of whom were advocating a moneyless economy without exchange and denying the existence of resource scarcity), Mises wrote his famous article, "Economic Calculation in the Socialist Commonwealth."

Mises' article was concerned with establishing two principal propositions. The first was a restatement of the Weiser-Pareto-Barone argument that all the same economic variables that guide resource use in a capitalist economy must also necessarily be taken account of under socialism. He

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8. For a description of early socialist and Marxist literature which makes this point, see Schumpeter (1954), pp. 877-885. This is not to say that there was no socialist economics before 1920. Rather there was no attempt by socialists to deal with the problem of efficient resource use and growth within the context of a consistent model before 1920. In his excellent review article of W. O. Henderson's Life of Friedrich Engels, T. W. Hutchison points out that Engels in his later work showed that he understood very well the vital importance of a competitive pricing mechanism when criticizing other socialists as "utopian," but ignored it when describing his and Marx' view of the workings of the economy after the Revolution. Hutchison comments, "Surely no one in the whole of intellectual history can have looked a major, pressing intellectual and practical problem so clearly and piercingly in the face and then so blithely and confidently passed on without a word." Hutchison (1978), p. 317.

argued specifically that it was naive to expect money and prices to disappear for very long under socialism, that as long as people have differing preferences (and as long as socialist leaders strive to satisfy consumer preferences), the allocation of consumer goods would present problems which could only be solved by resorting to some system of money and prices. In fact, since consumer goods presumably would be owned by consumers themselves, the development of prices and markets in consumer goods was inevitable. The real problem, according to Mises, was in the allocation of capital goods — the means of production. Since these would not be privately owned, markets could not be utilized to determine resource prices, and hence, there would be no way to evaluate relative resource scarcities. He conceded that while socialism may be possible in a static state where knowledge of unchanging economic parameters is universal and where the imputation problem, once solved, would remain solved forever, he emphasized that such a static state itself is only a "theoretical assumption corresponding to no real state of affairs." In any real socialist world, the impediments to rational economic calculation are legion: the inevitability of change, the uncertainties that this implies in all economic decision-making, the problem of initiative without private property, and the necessary elimination of the "promoter and man of affairs" who makes the market work to establish relevant prices. Mises second proposition, then, was that without free markets based on private resource ownership, economic calculation would be totally impossible. It was this second proposition that infuriated socialists, challenged conventional economists and became the focus of attempts to refute Mises.

16. One reason Mises infuriated socialists is that he deliberately chose to clothe his arguments in highly polemical garb. He claimed, for example, that "Every step that takes us away from private ownership of the means of production and from the use of money also takes us away from rational economy," (p. 104), and "Where there is no free market, there is no pricing mechanism; without a pricing mechanism, there is no economic calculation." (p. 111), He even went so far as to claim that the absence of free markets under socialism would lead to the end of "rationality and logic in thought itself." (p. 105), While it is true that in so stating his arguments, he was using polemics to answer polemics, the result of his emotionally charged style was that the style was better remembered than the cogency of the argument.
Although there was much discussion of the problems Mises raised during the 1920’s in the German literature, the creation of an economic model of socialism along neoclassical lines was a product of English speaking economists in the 1930’s. Three men especially stand out as originators of socialist economics: H. D. Dickinson, Oskar Lange and and Abba Lerner. Of the three, Dickinson was first in print with his preliminary model, Lange’s work came to represent the “economic theory of socialism” (and incidentally was credited with offering the definitive refutation of Mises), and Lerner’s marginal cost rule made a significant contribution to the work of the other two. 

Dickinson and Lange developed very similar models of socialist economy in which there would be private ownership of consumer goods and freedom of choice in occupation, but public ownership of all capital goods and non-human productive resources. Where their models differed most significantly, at least initially, was in the methods suggested for obtaining relative values to guide resource allocation. Dickinson’s solution to the pricing problem was to set up selling agencies which would determine the prices of all goods by a combination of several methods: The prices for consumer goods would be set according to what the market would bear, the agencies “raising (prices) when stocks fell short, lowering when they accumulate.” In this way they would be able to determine statistically all the demand functions for all goods which, when combined with technologically determined production functions and a given supply of resources, would enable the central planning board to impute factor valuations. Dickinson also seemed to propose that the planning agency, operating within the “glass walls” of socialism (where all demand functions, production functions and resource supplies are known to planners) would be able to construct a mathematical model of the economy which would be solved for resource prices using a system of simultaneous equations à la Barone. 

17. Accounts of some of these clearly socialist responses can be found in Hayek (1935), pp. 1-40, and Hoff (1949), Chapter IV, V).

18. Dickinson’s model was first published as an article in the Economic Journal in 1933. He later expanded and refined it in his booklength The Economics of Socialism (1939). Lange's major contribution was his two part article, “On the Economic Theory of Socialism” published in the Review of Economic Studies (1936, 1937) and later reprinted together with Fred Taylor's "The Guidance of Production in a Socialist State." See Lange and Taylor (1938). Lerner contributed several articles to the development of socialist economics, but perhaps his most famous is "Statics and Dynamics in Socialist Economies" (1937). Lerner has charmingly recalled the genesis of the marginal cost rule he proposed in that article and his personal conversations on the subject with Lange in Lerner (1973).

19. Dickinson (1933), p. 239.


Lange’s solution to the pricing problem was simpler. He too, proposed setting up a central planning board to administer prices, but only resource prices. Consumer goods would be priced in free markets in order to provide accurate information for factor valuation. Factor prices would then be determined by a system of “trial and error” exclusively, the process partially adopted by Dickinson but originally proposed by F. M. Taylor in 1928. Lange’s use of trial and error was a conscious attempt to overcome the myriad difficulties inherent in an attempt to solve for prices using statistical demand curves and econometric models, difficulties stressed by both Robbins and Hayek. In response to the critics, Lange argued forcefully that there was no need to set up systems of simultaneous equations to find factor prices as long as the planning board “fixes the prices so as to balance the quantity supplied and the quantity demanded of each commodity.” Lange believed that trial and error described the process by which prices are formed in real markets, and he patterned his method after a Walrasian tâtonnement with the central planning board acting the part of the auctioneer.

After Lange’s work appeared in print, the socialists, as well as many non-socialists, agreed that the problem of pricing under socialism had been solved by the trial and error process, and what remained to be explored was how these prices should be used in the actual production of goods and services. Hence, after the publication of Lange’s article, the problem of what set of rules would induce managers of socialist firms to make decisions that would lead to appropriate resource allocation replaced the problem of pricing in the literature on socialist economics.

Lange’s contribution to the question of managerial rules had been to point out that in pure competition, profit maximization and the freedom of entry and exit are the mechanisms which assure allocative efficiency. Thus, to duplicate the results of perfect competition, it was necessary to force socialist managers to behave like perfect competitors by imposing two rules of behavior on them: As an alternative to profit maximization, they would be instructed to minimize factor costs for the given set of resource prices, and to equate marginal cost to product price in the production of output. The first would guarantee efficient use of resources and the second, appropriate plant size. When applied to the industry as a whole, the second rule would also control the size of the industry. As long as socialist managers observed the “parametric function of price,” that is, as long as they, like perfect competitors in genuine markets, treated resource and product prices as parameters rather than dependent

25. Lange ((1938), p. 70 and pp. 82-83).
variables, his rules would lead to the same resource allocation as perfect competition.\textsuperscript{27}

By the end of the decade, the outline of a neoclassical economic theory of market socialism was complete. Consumer goods are priced in genuine markets, communally owned resource prices are determined by a central planning board through the trial and error process, and managers at both firms and industries are told to produce where the marginal cost of output equals the price of the product produced and the price of any resource employed equals the marginal contribution of that resource to output. Any change in parameters will manifest itself as a change in price which will cause managers to alter firm production and industry size accordingly. Clearly, these neo-classical socialists believed they had shown that economic calculation was just as possible under socialism as it was under capitalism. That in order to do so they had to create a socialism that bore no resemblance to any existing political states and which had nothing to do with Marxist economics was irrelevant. Their economic model was still within the spirit of socialism although it retained many important features of capitalism.\textsuperscript{28} In addition, they believed their brand of socialism was both economically and morally superior to free market capitalism. With a system of market socialism, one could more rationally direct economic growth through appropriate manipulation of the rate of interest, and production in general would increase because of the elimination of monopoly power and the waste associated with business cycles and inappropriate coordination of private production plans. Furthermore, income distribution under socialism would be morally superior to capitalism because of the absence of income derived from property ownership, and because of the ability of the central authority to adjust wages to eliminate rents.\textsuperscript{29} Certainly, they believed Mises had been decidedly refuted many times over by the end of the decade.\textsuperscript{30}

\textsuperscript{27} Lange ((1938), p. 81). The problem of managerial rules was also addressed by E. M. F. Durbin in his 1936 article in the \textit{Economic Journal} although his instructions for socialist managers were somewhat different from Lange's. Durbin would tell them (a) to produce the largest output possible in any existing plant that is consistent with making normal profits, and (b) where normal profits could not be earned, to equate price to marginal cost (p. 686). Hence he, even more than Lange, was attempting to reproduce the symptoms of static equilibrium in perfect competition in a socialist economy. Lerner effectively attacked this position in Lerner (1937). There he formulated his famous marginal cost rule in which he argued that in so far as the goal of socialism is the maximization of the value of production, one should assure that no resources be used to produce a commodity which can be used to produce a more highly valued commodity elsewhere. This can be accomplished by equating prices to marginal cost at every decision point. (p. 251).

\textsuperscript{28} Mises would not have agreed with this statement. To him, socialism and markets were mutually exclusive categories (as they were to many Marxists at the time when Mises was writing). Hence any move to restore markets in a collectivist economy was a step away from original socialist aspirations. See Mises ((1936), pp. 705-706).

\textsuperscript{29} Lerner ((1937), pp. 269-270).

\textsuperscript{30} An interesting illustration of the degree to which Mises was anathema to the socialists was Lerner's comment in "Static and Dynamics in Socialist Economics," (Lerner (1937)). Although he thoroughly and very effectively criticizes the many flaws in Durbin's formulation of managerial rules, he nevertheless introduces his comments by saying Durbin "refutes anew the well-known thesis of Professors Mises, Hayek and Halm that a socialist economic calculus is impossible." (p. 251)
So far, we have considered only the socialists' contribution to the debate over economic calculation. It has been possible to review the development of the economic theory of socialism without reference to Hayek's writings because despite the fact that the socialists apparently read his essay, there was very little notice taken of the criticisms he offered of the socialist schemes. Hence, it is more in keeping with the actual course of the controversy to treat Hayek's comments as a critique apart from the development of socialist economic theory.

What seemed to trouble Hayek the most about neoclassical socialist economics was what he regarded as an inappropriate application of static equilibrium models to the formation of a new economic order. He respected the usefulness of the concept of equilibrium for limited explanatory purposes, but believed that the socialists were overstepping those limits by venturing into the realm of planning on the basis of equilibrium models. While the high level of abstraction of the Walrasian general equilibrium model in particular might be an advantage in explaining precisely the end point of a market process, this level of abstraction which is an asset in simplifying explanation also precludes the model's usefulness as a blueprint for constructing a different, non-market economy. 31 What this model omits — considerations of the process by which equilibrium is approached, the effects of uncertainty on the conclusions of the model, consideration of what constitutes economic information and to whom it is available — are, each one, sufficient to guarantee that an economic order resulting from conscious planning according to that model will be far different from the one envisioned by the planners. Thus, Hayek argued specifically that while the models the socialists were using to arrive at their solution to the pricing problem were not logically contradictory and socialism was not therefore impossible in the sense of being theoretically inconceivable, it was nevertheless practically impossible since the socialist models bore no relationship to the manner in which prices were formed in the real world. 32 In general,

31. Hayek published only three articles dealing specifically with the problem of economic calculation under socialism. The first two were original contributions to his volume of essays, Collectivist Economic Planning (1935). The lead essay in this volume (pp. 1-40) was a review of the controversy until 1935, and the concluding summary was a critical article, “The Present State of the Debate” (pp. 201-243). The third and final article which Hayek published on the subject was his 1940 review of Dickinson's and Lange's books on socialist economics. (Hayek ((1948), pp. 181-208)). However, in order to understand Hayek's position more fully, one should also consult several other articles he published during the 30's and 40's, “Economics and Knowledge” ((1948), pp. 33-56), “The Use of Knowledge in Society” ((1948), pp. 77-91) and “The Meaning of Competition” ((1948), pp. 92-106). Although not strictly directed to the debate, they all dealt in a more abstract manner with exactly the kinds of criticisms Hayek made of the socialist programs.

32. This is, for example, the sense of his statement that “all the difficulties which have been raised are 'only' due to the imperfections of the human mind. But while this makes it illegitimate to say that these proposals are impossible in any absolute sense, it remains not the less true that these very serious obstacles to the achievement of the desired end exist and that there seems to be no way in which they can be overcome.” Hayek ((1935), p. 238). Hayek further developed his concept of the nature of economic equilibrium and its relationship to knowledge in “Economics and Knowledge.” ((1948), pp. 33-56).
the market socialists misunderstood the nature of the market economy and were misapplying the market models they were using.

It is true that Hayek never said this in so many words all in one place; it unfortunately is the fate of a critic to have his own vision revealed only piecemeal and in reaction to the work of others. Yet this was the heart of Hayek's argument against the socialists, and whether or not he was correct, his argument was a profound one that deserved careful attention. Instead, there apparently was some confusion over what Hayek meant by the possible versus the practical in economic model building because Lange took Hayek's work to represent a "second line of defense" of capitalism. Lange claimed that Hayek now admitted that Mises had been wrong, that socialism was possible "in theory," but that there were just practical objections to its implementation.\(^{33}\)

At the center of the confusion was a failure to agree on what constituted a theoretical objection to socialism (or any model meant to tell us something about the real world) and what was "merely" a practical one. The socialists (and most of the economics profession at the time) seemed to believe that the demonstration that the same economic logic applies to both capitalism and socialism was sufficient proof that socialism was "theoretically possible," and hence they pointed to Pareto and Barone as having refuted Mises' claim that socialism is impossible.\(^{34}\) Neither Mises nor Hayek ever argued that the socialist models were inconsistent given their assumptions, however. What they argued was that the ability to calculate rationally under socialism was "practically impossible" because the theory, while logically consistent, did not capture enough important features of the real world to make it applicable. This is hardly a "practical" objection in any useful sense of the word. Certainly, this kind of "practical" objection can not be shrugged off as trivial. Nevertheless, it was Lange's simplistic interpretation of Hayek's sophisticated insight that was accepted by the profession with the unhappy result that the really interesting and important question of what constitutes an appropriate model for a socialist economy was never formally discussed.\(^{35}\)

The major source of Hayek's criticisms of the wholesale application of general equilibrium models to socialist economies was his perception of the role of information in economic decision making, a problem which has only recently been recognized in the theoretical literature.\(^{36}\) Standard neoclassical models begin with the assumption of given utility and

33. Lange ((1938), p. 63)

34. Lange ((1938), p. 59).

35. This might not have been so serious an omission if the market socialists were doing no more than playing theoretical games of market simulation. Instead they were purporting to describe the potential design and operation of a real economy which made exploration of the differences between capitalism and socialism, and the implications of these differences for modeling the economic structure, vastly important.

36. See for example, Rothschild (1973).
production functions which, when ground through the maximization model, imply a set of relative product and resource prices. Lange pointed out that the same information which guided economic decisions in capitalism would also be available in a socialized economy. To Hayek, saying that the information was "available" was just the beginning of the problem of demonstrating the possibility of a non-market economy. The real problem of any economic model is to show how the information necessary for rational decision making which exists in the minds of millions of separate individuals can be transmitted to appropriate decision makers in such a way as to permit an orderly economy to emerge. The market is one highly successful means of encouraging the production, transmission and use of information because it takes advantage of decentralization of knowledge and of decision making. Hayek referred to this as the division of knowledge. The burden of proof therefore was on the socialists to show that centralization could improve upon the market's production and use of information.

Hayek's emphasis on the role of information in the economic process is well illustrated in his discussion of the Dickinson-style mathematical solution to the pricing problem. Hayek objected to the mathematical solution in part because of the practical difficulties involved in solving what would necessarily be a formidable set of equations once the data is given. This was the objection upon which the socialists concentrated their rebuttals. However, Hayek's more profound criticism was that given the way in which information is discovered and used in a market economy, it would be physically impossible for a planning board to acquire the information necessary to specify those equations.

The information that individuals use to guide their economic activity is vast, detailed and necessarily incomplete. It is not neatly summarized in objective demand and cost functions which need only be revealed to central planners in order for them to take over the task of economic decision making. Even if it were possible to arrive at useful demand functions for consumer goods, it would not be possible to obtain objective production functions and cost functions which represent those which describe a free market. The major reason Hayek gave was that such information is not given, but is the subject of continuous discovery. Neoclassical economics emphasizes "engineering knowledge" or knowledge of production techniques as if it were the only information relevant to business decisions. In fact, efficient resource use depends as much upon

37. See for instance, Lange ((1938), pp. 60-61).
knowledge of "time and place" — the ability to perceive opportunities others miss and to know when to take advantage of them. Further, some information may be no more than a "technique of thought" which enables a producer to "find new solutions rapidly as soon as he is confronted with a new constellation of circumstances." Market prices are the result of transactions among individuals with unique and fragmented knowledge and are a means by which this decentralized knowledge is coalesced into a coordinated whole. To try to summarize all this information into a set of simultaneous equations would be quixotic at best.

Hayek's perception of the role of information in economic analysis also provided the basis for his criticism of the Lange-Taylor trial and error method of pricing — the socialists' solution to the difficulties inherent in trying to operate an economy using econometric models. Hayek argued that trial and error pricing would not be able to duplicate free market pricing for two reasons: One had to do with the timing of price changes and the other, with the problem of specifying the product accurately. As for the first, neither Lange nor Dickinson (who also adopted the trial and error techniques in his 1939 book, The Economics of Socialism) made clear at what intervals the central planning board would change prices in response to surpluses and shortages. Hayek pointed out that only if the price of every good was to be changed immediately whenever some imbalance was perceived would a planning board come close to approximating the market. More likely, however, there would be some accounting period at the end of which prices would be adjusted. Since the data are always changing, in between these accounting periods, the official prices would be disequilibrium prices which would prolong excess demands and supplies and hence, also prolong resource misallocation. Of course, he was not implying that market determined prices are never in disequilibrium: Rather the implication was that market prices will be in disequilibrium less often than centrally controlled prices and will always be changing in the "right" direction thus giving correct market signals even if they are technically in disequilibrium. Markets enable buyers and sellers to react more quickly to changing data because the path by which information must travel in order for corrective price changes to be effected is shorter than it would be under socialism.

45. Hayek ((1948), pp. 187-188, 192-194). His position is summarized in the following: "If in the real world we had to deal with approximately constant data, that is if the problem were to find a price system which then could be left more or less unchanged for long periods, then the proposal under consideration would not be so entirely unreasonable. With given and constant data, such a state of equilibrium could indeed be approached by the method of trial and error. But this is far from being the situation in the real world, where constant change is the rule. . . The practical problem is not whether a particular method would eventually lead to a hypothetical equilibrium, but which method will secure the more rapid and complete adjustment to the daily changing conditions in different places and different industries. How great the difference in this respect would be between a method where these prices are decreed from above, is of course, a matter of practical judgment. But I find it difficult to believe that anybody would doubt that in this respect the inferiority of the second method would be very great indeed." (p. 188).
In addition to the problem of slower reaction time, Hayek also pointed to the problems a planning board would have with trying to specify the products to be assigned prices, and again this was a problem that refers to the kind of data available to decision-makers. In effect, Hayek argued that there are more dimensions to the objects of exchange than price and quantity. In the real world, unlike the model of perfect competition, many products are not standardized with uniform, competitive prices. In capital markets especially products are often physically unique, and where they are physically similar, they vary according to location, time of availability, and concomitantly offered services. It would be unlikely that any planning board would be able to take account of all these characteristics in defining products for which to set prices. Hence, a central planning board would be setting prices for aggregates of goods that were not representative of all the different products subject to economic exchange. This would necessarily reduce the informational content of prices, the adaptiveness of resources to various production processes and the variety of production techniques employed.\(^{46}\)

Of these three criticisms Hayek offered of socialist pricing schemes, the misunderstanding of the character of the information which guides economic activity, the difference in the speed of adjustment to changing data between socialism and capitalism, and the difficulty in defining what a “product” is for accounting purposes, the first was not dealt with by the socialists (and apparently was not acknowledged to be a genuine problem by those who later evaluated the controversy),\(^ {47}\) and the second two were considered to be minor empirical objections to socialism which could be worked out and which in any case would not lead to serious distortions in resource allocation.

Even if the pricing problem were solved, Hayek, taking his cue from Mises, still believed that there would be great difficulties in attempting to operate an economy without private ownership of the means of production. Hence, he believed that even Lange’s “competitive socialism” would necessarily fall short of the level of economic well-being the market is capable of yielding. Lange had claimed that all that was necessary to show that socialism was capable of allocating resources as well as capitalism was to refer to the “parametric function of price.”\(^ {48}\) That is, all that was necessary for socialism to work was to insure that managers of firms and industries behave like perfect competitors and treat resource


\(^{47}\) Schumpeter (1942) believed that “In any normal situation, it (the socialist economy) would command information sufficient to enable it to come at first throw fairly close to correct quantities of output in the major lines of production, and the rest would be matter of adjustments by informed trial and error.” (p. 185). In addition, he claimed that since uncertainties about competitors’ reactions and general business climate would be eliminated, solving practical business problems under socialism would be easier (p. 186). See also Bergson (1948).

\(^{48}\) Lange ((1938), p. 80).
and product prices as if they were independent of the producers' production decisions. The problem, aside from the question of whether or not the "parametric function" actually describes the way prices operate in a competitive economy, is that socialist managers would not really be perfect competitors. While there might very well be many firms in an industry with firm managers making output decisions on the basis of given prices, Lange's plan also required the existence of industry managers who would make decisions regarding the growth or decline of the industry as a whole. The industry manager, then, would really be in a position of a monopolist who knows his output decisions will affect the price of his product. Only if he could be convinced to ignore his effect on the price of the product, could Lange's solution be consistent with his model. Lange's method of dealing with the problem was for the Central Planning Board to impose an "accounting rule" which would instruct industry managers that "All accounting has to be done as if prices were independent of decisions taken."49 Both Mises and Hayek questioned the likelihood of managers actually following such a rule when it easily could work contrary to their own personal long run interests.

Mises especially had argued that the role of the manager in a socialist state was crucial to the success or failure of the system. One of the reasons Mises gave for the "impossibility" of socialism was that managers could never be substitutes for private businessmen: that one had to risk one's own income on the consequences of the decisions one makes if the market is going to yield the most efficient outcome.50 One particular socialist argument that Mises took pains to contradict was that managers in socialist enterprises would be no different from managers of private corporations who are not themselves owners of stock in the company. Mises acknowledged that this might be partially true, but countered that the most successful corporations were those whose managers did have a direct stake in the success of the business either through bonuses or shareholding.51 While this claim is open to empirical testing, Mises also hinted at a more sophisticated theoretical argument against identifying corporation managers with socialist managers: that it is the capital markets which keep private managers in line, that the owners of private capital can shift resources from unprofitable to more profitable ventures and thus put poor managers out of a job.52 Where profit or loss no longer serves as an objective test of managerial success, as it likely would not under socialism, it becomes exceedingly difficult to weed out inefficient managers.

Hayek enlarged on this theme when he argued that under socialism, where a manager's decisions are not subject to the objective test of profit

49. Lange (1938), p. 80).
52. Mises (1922), p. 139).
or loss to determine their correctness, one's success as a manager would therefore depend upon convincing the planning board that the decisions he made in the past were the best given the alternatives available. As a result, managers would be less likely to make risky decisions regardless of their potential profitability because the consequences of failure far outweighed the benefits of success to their careers.\textsuperscript{53}

While the actual propensity to take risks depends upon the constraints facing individual socialist managers and an argument can be made that they will be either more or less prone to risk taking than private entrepreneurs (in fact, Mises had argued that managers would be more prone to risk taking than private entrepreneurs since they did not have potential loss of personal wealth to constrain their behavior),\textsuperscript{54} the problem both Mises and Hayek were approaching was essentially one of the effects of different specifications of property rights on individual economic decision making. The issue of property rights, which has provided such a fruitful framework for modern analysis of socialist economies,\textsuperscript{55} was only touched-on in the early literature on socialism. It was generally contained under the rubric of "incentives" with the critics arguing that without private property, people would have no incentive to produce and the early socialists countering with descriptions of the change in human nature which would occur after the abolition of the evils of the capitalist system. The later socialists tended to dismiss the problem of the relationship between managerial incentives and managerial decision-making entirely as being more in the province of sociology than economics.\textsuperscript{56} Instead they concentrated their energies on defining a set of managerial rules which would lead to efficient levels of output without considering how to induce people to follow the rules they devised.

Even granting that a planning board could devise appropriate managerial rules and induce managers to follow them, Hayek implied that determining whether or not the rules had been followed was not as easy a task as it might seem at first blush. The socialists' managerial rules, as we have seen, generally involved instructing the manager to equate the "parametric" price to some measure of cost to achieve optimal output. The most theoretically satisfying rule was Lerner's which instructed managers to expand output (or input use) to that point where price equals marginal cost at every decision point.\textsuperscript{57} Hayek criticized the workability of even this rule, however, and in so doing implicitly criticized all rules that assumed that costs could be treated as objective data.\textsuperscript{58} In fact, only


\textsuperscript{54} Mises (1922), p. 140).

\textsuperscript{55} For a summary treatment of the property rights approach to study of socialist economies, see Furubotn and Pejovich (1972), pp. 1154-1157).

\textsuperscript{56} See for example Lerner (1937), p. 267), Lange (1938), p. 109), and Durbin (1937), p. 687).

\textsuperscript{57} Lerner (1937), p. 251).

\textsuperscript{58} Hayek (1935), p. 226) and Hayek (1948), p. 196).
current prices are objective data available to producers while costs are ultimately subjective evaluations of the utility of foregone alternatives, the value of what could have been produced with the resources now being used to produce one's product. Hayek argued that in full market equilibrium, the value of foregone alternatives were accurately measured by market prices of resources, but in the real world where static equilibrium conditions do not obtain, the value of foregone alternatives can only be individual estimates of the possible effects of different courses of action.59

The relevance of this thoroughly "Austrian" view of costs to socialist economy is most pronounced in the valuation and use of capital in a non-market setting. Capital creation and use necessarily depends upon an entrepreneur's subjective estimates of future values. Since a socialist manager's estimates of current capital value would be based only partly on current prices, but more on his estimates of possible market changes, conjectures about the planning board's response to these changes, his evaluation of the risks involved in his decisions, and his propensity to take risks, it would be impossible for costs perceived by the manager to be objectively measured by some outside observer. If marginal cost is a subjective estimate that has no "correct" value, then the planning board would have no way of discovering if the firm had followed its directive. Hence, Hayek argued that the planning board would have to engage in detailed audits of the firm's books to see if at every decision point the manager took the "best" course of action available to him. But "best" would now mean best according to the planner who would have to substitute his judgment for that of the socialist manager in the evaluation of costs.60 There were no simple rules for judging managerial success in a non-market setting.

IV.

To the modern reader who is aware of the empirical record of the last thirty years of East European and Russian Communism, the early work of Lange and Dickinson (as well as the professional acclaim accorded them)61 seems naive at best. For the greater part of the short history of communist states, price has not been used as the primary allocative


61. Professional evaluation of the calculation controversy in the 1940's was overwhelmingly that the socialists had the best of the argument. See, for example, Bergson (1948). Perhaps Schumpeter (1942) best summed up the current consensus when he stated that "as a matter of blueprint logic, it is undeniable that the socialist blueprint is drawn at a higher level of rationality," (p. 183) (which in effect meant that a Walrasian general equilibrium model was more descriptive of socialism than it was of capitalism). While he later warned that this might have nothing to do with the workability of either capitalism or socialism (Schumpeter (1954, p. 989)) he nevertheless believed that the theoretical case for socialism was stronger than the one for capitalism.
mechanism. Output quotas instead have been the rule rather than the exception with all of the concomitant problems of resource misuse and sheer waste that even the socialists of the 1930's predicted. It is only recently that attempts have been made in the more liberal of the communist countries to move closer to lange-type market socialism in a belated vindication of both the Austrians and the market socialists. 62 However, one feature which stands out in the modern literature of market socialism is the attention paid to incentive structures. Despite an almost contemptuous dismissal of the problem during the original debate, even Lange in his later work put incentives in the forefront of the problems of socialist economy still to be solved. 63 The major problem now seems to be whether or not rational incentive structures can be built into a socialist economy so that economic agents actually do what the planners want them to do: whether there can be a good substitute for profits to make the system function effectively. Gone are the blithe assertions of the superiority of socialism in reaching the "perfection" of perfect competition more easily than capitalism.

It is not only as a predictor of actual economic events that Lange's 1936 work suffers by comparison to Hayek's essays but also as a contribution to theoretical economics. Of course, it is unfair to criticize Lange for failure to perceive all of the problems inherent in the wholesale application of Walrasian general equilibrium to a socialist economy since he was writing before the major work on such models was even begun. In fact, when one considers the state of the art in 1936, Lange's use of Walras in comprehending and describing an economic system is a formidable achievement indeed. Yet, recognition of the greatness of Lange's work can only increase one's respect for Hayek's. Today Hayek seems more modern than Lange precisely because he was able to pinpoint many of the most crucial defects in Lange's exposition long before the economics profession came to recognize these same criticisms in their attempt to refine and extend simpler Walrasian models. In fact, a listing of Hayek's major criticisms of market socialism — the failure to take account of adjustment processes, the misunderstanding of the problem of decentralized and incomplete information, the lack of appropriate incentive structure —

62. There has been a wealth of articles describing and analyzing "sovet-type" economies in light of the reforms which took place during the late sixties. Representatives of just a portion of this group are Belassa (1970, Bornstein (1974), Furubotn and Pejovich (1970) and Prybyla (1966). For a favorable reevaluation of Hayek's original criticisms in light of the historical experience of socialist economies, see Bergson (1967).

63. Lange (1962), p. 19. "... it seems that the greatest obstacle to further progress results from the lack of proper economic incentives in ... bureaucratic, centralistic-type management." And "There are also other economic laws which must be observed by the plan. These are the laws which result from the operation of economic incentives under the circumstances created by the plan ... By utilizing economic means planning makes use of the automatic character of people's responses to given incentives." (p. 24) It is interesting to note that at least one socialist economist has suggested a means by which some form of profits might be incorporated into socialist incentive structures. See Bajt (1968).
reads like a research program for general equilibrium theorists for the last three decades.\textsuperscript{64}

To dwell for a moment on a single, far reaching example, one has only to consult the growing literature on the economics of information to see the contemporary relevance of Hayek's work. The modern literature asks "how individuals should and do behave when imperfectly informed"\textsuperscript{65} and then goes on to construct models based on different assumptions about economic behavior and the amount of knowledge available to market participants. While it shows that it is possible to construct models with imperfect information which converge toward an equilibrium, the equilibria vary with the assumption about the knowledge and market behavior. These models are a far cry from Lange's "parametric function of price," and in them we see partly why Hayek's early work, in which the information problem was always central, is quoted and referred to today with increasing frequency in the theoretical literature.

I began this essay by claiming that the controversy between the advocates of socialism and their critics was at heart a contest of theoretical models based on differing perceptions of what a market economy really was. The socialists seemed to regard the market as a mechanism, the salient features of which were accurately captured in simple general equilibrium model. Human beings were assumed to react automatically to market signals and could be counted on to react just as automatically to commands from a central planning agency. The institutional structure and the system of incentives implicit in the structure were assumed to have no affect on economic behavior. Hayek, on the other hand, understood the market to be fundamentally entrepreneurial in nature. Equilibrium models, he argued, could be no more than a useful preliminary to the study of the main problem,\textsuperscript{66} which was to show how the market enables profit seeking individuals to make choices in an environment of decentralized and incomplete information and uncertainty about the future, and in which they bear the consequences of their choices. To Hayek, the market economy is essentially a spontaneously evolved institutional response to the difficulties of coordinating economic activity in a complex and changing world. Because the real world is so complex and so changeable, it was clear to him that the simplistic models constructed by the market socialists, if used to operate a real socialist economy, were doomed to produce an economic environment far different from, and far inferior to the one they envisioned in their plans.

\textsuperscript{64} A good summary of modern attempts to take into account adjustment processes, information content of models, and incentive structures can be found in Hurwicz (1973).

\textsuperscript{65} Rothschild ((1973) p. 1236). This article suggests that current work in models with imperfect information is a direct outgrowth of Stigler's 1961 article, "The Economics of Information." One major difference between the modern approach and Hayek's view of information is that Hayek saw incomplete and decentralized information to be the distinguishing feature of markets and the reason for their existence while the modern literature, following the implications of earlier general equilibrium models, still sees imperfect information as a defect that needs to be explained away within the context of maximization models.

\textsuperscript{66} Hayek ((1948), pp. 44-45).
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