

# Mises and Hayek on Calculation and Knowledge

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## Calculation versus Knowledge

Several Austrian economists have recently introduced an emphatic distinction between calculation problems and knowledge problems besetting socialism. F. A. Hayek, they suggest, has shoved aside or perverted the analysis that Ludwig von Mises got straight in the first place. Especially now that experience in Eastern Europe bears out the arguments of Mises and Hayek, it is important to face the issue of the supposed tension between their positions.

"While Mises saw calculation as *the* problem of socialism," says Jeffrey Herbener (1991, p. 43), "Hayek views it as a knowledge problem." "Mises demonstrated that even with *perfect* information, the central planners in socialism cannot rationally calculate how to combine resources to render efficient production."

According to Joseph Salerno, "Mises unswervingly identified the unique and insoluble problem of socialism as the impossibility of calculation—not, as in the case of F. A. Hayek, as an absence of an efficient mechanism for conveying knowledge to the planners" (Postscript 1990, p. 59, in a section entitled "Mises vs. the Hayekians"). The "Hayekian position criticizing the relative inefficiency of non-market mechanisms for discovery, communication, and use of knowledge in the allocation of productive resources" is "categorically different" from the Misesian critique (Ibid., p. 64).

"For Hayek, the major problem for the socialist planning board is its lack of *knowledge*," says Murray Rothbard. Hayek's "argument for the free economy and against statism rests on an argument from ignorance." For Mises, however, the central problem is not

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“knowledge.” Even if the planners had perfect knowledge of consumers’ value priorities, of resources, and of technologies, “they *still* would not be able to calculate, for lack of a price system of the means of production. The problem is not knowledge, then, but calculability.” The “role of the *appraising entrepreneur*, driven by the quest for profits and the avoidance of losses, . . . cannot be fulfilled by the socialist planning board, for lack of a market in the means of production. Without such a market, there are no genuine money prices and therefore no means for the entrepreneur to calculate and appraise in cardinal monetary terms” (Rothbard 1991 in a section on “Fallacies of Hayek and Kirzner,” pp. 65–68).

### An Untenable Distinction

I question the supposed distinction between calculation and knowledge problems. Mises’s own writings, writings of several other interpreters, and my own long acquaintance with the ideas of both Mises and Hayek warrant this question. Beyond citing actual words, I appeal to a heuristic principle of textual interpretation. A writer should be accorded the presumption—defeasible, to be sure—that his arguments cohere in their main lines and are not downright preposterous.

Hayek studied under Mises, though only informally. He once worked for him in a temporary Austrian government office and later was a member of Mises’s private seminar. He testifies to the great impact that Mises’s *Socialism* had on his own thinking (Foreword to Mises 1981). Hayek’s essays on socialist calculation and on the use of knowledge in society (several of them collected in his books of 1935 and 1949) develop and elaborate on insights that were at least implicit in Mises’s formulations.

Most briefly, for Mises “[t]he problem of socialist economic calculation is precisely this: that in the absence of market prices for the factors of production, a computation of profit or loss is not feasible” (Mises 1963, p. 705).

But what is the problem that genuine prices help solve? In large part, on my reading of both Mises and Hayek, it is lack of the information (as well as of the incentives) that prices would convey. I cannot believe Mises was merely saying that *if* the socialist planners possessed in some remarkable way all the information normally conveyed by genuine market prices, they still would be stymied by inability to perform *calculations* in the narrow arithmetical sense, an inability that advances in supercomputers might conceivably overcome. Such a reading of Mises’s arguments would caricature and trivialize them.

## **Economic Calculation**

Let us review what economic calculation means and what functions prices perform. (To remind readers briefly of familiar points, I omit elaborations and qualifications that might be necessary to forestall objections; see Yeager and Tuerck 1966, chap. 2.)

Ultimately, additional units of any product cost foregoing other products or benefits that might have been chosen instead. Technology and the scarcity of resources pose the need to choose among alternative patterns of production as rival and practically unlimited desires compete for those resources. The other side of the same coin is choosing how to allocate scarce resources among different lines of production.

How might a definite plot of city land be used most advantageously—as a wheat field, a parking lot, a site for a swimming pool or hotel or office or apartment building, or what? By the logic of the price system, this resource goes under the control of whoever will pay the most. In bidding for its use, business firms estimate how much it can contribute, however indirectly, to producing goods and services that consumers want and will pay for. How much value it can contribute depends not only on physical facts of production but also on the selling price of each of the possible final products, and this price depends in turn partly on opportunities to produce the product in other ways. Wheat grown on cheaper land elsewhere would keep anyone who wanted to use city land to grow wheat from affording to bid highest for it. Not only natural resources but also capital, labor, and entrepreneurial ability thus move into lines of production where they contribute most to satisfying consumer needs and wants, satisfactions being measured by what consumers will pay for them.

Another example concerns public transportation in a particular city. (Compare Mises's example of building a railroad; 1990, pp. 24–25). Should it be supplied by buses burning gasoline, by electric streetcars, in some different way, or not at all? The economically efficient answer depends on more than technology and the physical availability of inputs. It depends also on substitutabilities and complementarities among inputs, on alternative uses of those inputs, and on consumers' subjective appraisals of various amounts of the various outputs of those alternative uses, as well as on appraisals of various amounts of various kinds of public and private transportation. The economically efficient answer even to the relatively simply question of local transportation depends, in short, on unimaginably wide ranges of information conveyed, in abbreviated form, by prices.

Ideally, in a competitive economy, the price of each product measures not only how consumers appraise it at the margin but also what the total is of the prices of the additional resources necessary to supply an additional unit of it. These prices, in turn, measure what those resources contribute at the margin to values of output in their various uses (as ultimately appraised by consumers) and so measure the values other outputs sacrificed by not using the resources for them instead. Prices therefore tell the consumer how much worth of other things must be forgone to supply him with each particular product. With necessary alternatives brought to his attention in this way, each consumer ideally leaves no opportunity unexploited to increase his expected total satisfaction by diverting any dollar from one purchase to another. In this sense consumers choose the pattern of production and resource-use that they prefer. Ideally, their bidding sees to it that no unit of a resource goes to satisfy a less intense effective demand to the denial of a more intense one.

Mises asks whether central planners, in the absence of and replacing a genuine market, could achieve such a result. This result goes beyond physical meshing of activities as portrayed by a self-consistent input-output table. Even mere physical consistency is itself almost impossible to achieve in the absence of genuine markets and prices, as Soviet experience illustrates (tractors idle for lack of spare parts, food rotting for lack of transport, and so forth). But correct economic calculation is a still more demanding task.

This distinction is close to the surface throughout Mises's discussions of economic calculation. It is evident in his distinction between "technical rationality" and "economic rationality" and in his remark that "technical calculation" is not enough to achieve "general and technological expediency" (1920/1990, p. 48). (Georg Halm says more about economic versus mere technical considerations in Hayek 1935, pp. 173, 187. Compare Hoff 1981, p. 295: "The question . . . is not whether factories can be built and efficiently conducted, but whether the factors of production could have been put to a more advantageous use by employing them elsewhere.")

Economic calculation takes physical relations into account, and far more besides. It takes into account the available quantities of various resources and possibilities of expanding them, the technology of input-output relations, and the physical complementarities and substitutabilities of various resources in various lines of production. But it also takes into account the subjectively perceived unpleasantnesses and amenities of different kinds of work, changes in the perceived disutilities of work and in the utilities of goods and services as their amounts increase, and complementarities

and substitutabilities of various goods and services perceived by consumers. Ideally, the result of successful economic calculation—which, to repeat, takes all sorts of subjective as well as physical considerations into account—is a state of affairs in which no further rearrangement of patterns of production and resource use could achieve an increase of value to consumers from any particular good at the mere cost of a lesser sacrifice of value from some other good. (A fuller discussion would introduce the concept of Pareto optimality at this point and explain why some distributional principle is also necessary to narrow a multiplicity of optima down to one. The leading distributional principle in a free-market economy, much modified, is that persons receive the values that the services of themselves and their property command on the market.)

### **What Mises Meant**

Mises's central message, as it comes across to me, is an explanation of why a central planning authority could not accomplish its task and why it must be accomplished, if at all, on a decentralized basis. Mises explains the indispensable role of genuine prices established on genuine markets where traders exchange privately owned goods and services, including capital goods and other productive resources.

Was Mises conceding that information might conceivably somehow be made available to a central planning board in complete and utter detail, including the quantities and supply functions of all productive resources at all locations, all production functions in actual or even potential use, and all utility functions of all persons? Was he supposing, furthermore, that all the mathematical forms and all the parameters of all these functions are precisely known, so that these quantities and functions already imply the marginal productivities of all factors, the marginal technical rates of substitution among all factors and all products, and the marginal utilities of and marginal subjective rates of substitution between all goods and services for all productive units and all persons at each of all conceivable quantitatively specific patterns of production and resource allocation? Was Mises conceding that the planners might conceivably assemble all of this unimaginably detailed information? Was he balking only at the next step, denying that they could use all of it to calculate a pattern of production and resource allocation that would in some sense be optimal? Was Mises conceding everything about the centralized availability of information and then balking only at the possibility of dumping it all into a computer and performing a vast exercise in programming? Does his whole argument boil down to a contention about arithmetic?

No, of course not. Mises would have thought it preposterous that the planners could even arrive at the threshold of the massive exercise in arithmetic. He was referring to *economic* calculation. The whole sweep of his writings about socialism shows that he was concerned to illuminate the immensity of the problem of achieving an economically rational pattern of production and resource allocation, a problem that market processes do tend to solve. He understood why central planners could not adequately replace them.

### Statics or Dynamics?

A subsidiary question concerns whether Mises saw the problem of economic calculation as besetting only a dynamic world, one in which the functions of entrepreneurship must be performed (or botched) somehow or other, or as a problem that, although still more complicated in a dynamic world, would be hugely complicated enough even in a static world. Mises did like to emphasize that changes of all sorts are continually occurring and that the prices to be taken into consideration are not merely "current" prices (which are data of very recent economic history) but also future prices, as best they can be conjectured by entrepreneurial insight. He understood the role of speculation in the broadest sense, including the function undertaken by capitalists and entrepreneurs who speculate not only on prices but also on innovations in markets, products, and production methods and who, instead of merely playing games, are staking their own careers and fortunes. He knew that business firms, far from just being given (as they typically are just postulated in the textbooks), are continually appearing, disappearing, merging, and splitting; these reorganizations are essential features of a dynamic economy.

On the second suggested interpretation, Mises perceived the calculation problem *even* for a static world, a problem that initial discussion in a static context would shed light on. Apparent support for each interpretation occurs in writings of Mises himself and of commentators such as Rothbard and Salerno.

A passage in *Socialism* suggests how to resolve or dissolve the issue:

[U]nder stationary conditions the problem of economic calculation does not really arise. . . . all the factors of production are already used in such a way as, under the given conditions, to provide the maximum of the things which are demanded by consumers. That is to say, under stationary conditions there no longer exists a problem for economic calculation to solve. The essential function of economic calculation has *by hypothesis* already been performed. There is no need for an

apparatus of calculation. . . . the problem of economic calculation is of economic dynamics: it is no problem of economic statics. (1922/1981, p. 120 ; compare Mises 1920/1990, p. 25)

Mises evidently means this: In a static economy, *by definition*, everything rotates around in the same old ruts. No need or scope exists for recalculating those ruts; breaking out of them would violate the assumption of a static state. But a static state does presuppose that economic calculation has already been performed. (It would have had to take account of the vast changes entailed by the very shift from capitalism to socialism.) Even from a background of unchanging “wants, resources, and technology,” calculation is necessary to arrive at the pattern of production and resource allocation that thereafter, by the very definition of “static economy,” need not and cannot be recalculated.

In short, a dynamic world immensely complicates the task of economic calculation that would be hugely complicated even in—meaning even to arrive at—a static state.

### **Mises’s Words Supporting My Interpretation**

Many passages in Mises’s writings recognize the knowledge aspect of the calculation problem. Already in 1920 (1920/1990, pp. 17–18) he wrote that “administrative control over economic goods . . . entails a kind of intellectual division of labor, which would not be possible without some system of calculating production and without economy.” Well, intellectual labor involves knowledge, and division of labor means leaving at least some knowledge, and action on it, decentralized. It is noteworthy that Hayek draws explicit attention to the original German version of this passage (in a talk of 1936 reprinted in Hayek 1949, p. 50 and footnote).

Again in 1920 Mises mentioned the task of gaining a “complete picture” of economic complexities. Technical calculation is not enough to

guide us in those judgments which are demanded by the economic complex as a whole. Only because of the fact that technical considerations can be based on profitability can we overcome the difficulty arising from the complexity of the relations between the mighty system of present-day production on the one hand and demand and the efficiency of enterprises and economic units on the other; and can we gain the complete picture of the situation in its totality, which rational economic activity requires. (1920/1990, pp. 48–49)

An intellectual grasp of the whole would be possible in a small household economy, Mises recognizes, but not in a large and complex social economy. Deciding how "to place the means at the service of the end . . . can only be done with some kind of economic calculation. The human mind cannot orientate itself properly among the bewildering mass of intermediate products and potentialities of production without such aid. It would simply stand perplexed before the problems of management and location" (1920/1990, p. 19). As these words suggest, "economic calculation" means something more than an arithmetical exercise, however massive.

*Human Action* tells us that "knowledge provided by the natural sciences," "the mere information conveyed by technology," is insufficient for "the economic problem: to employ the available means in such a way that no want more urgently felt should remain unsatisfied because the means for its attainment were employed—wasted—for the attainment of a want less urgently felt. . . . What acting man wants to know is how he must employ the available means for the best possible—the most economic—removal of felt uneasiness" (1963, pp. 206–7). Again, Mises indicates that knowledge of wants, resources, and technology must be available to decisionmakers.

Another passage in *Human Action* (1963, p. 696, partly quoted in Salerno 1990, pp. 45–46) seems at first to resist my interpretation. Mises supposes that the director of the socialist economy has already made up his mind about ultimate ends or priorities. Somehow, miraculously, everyone agrees. The director has complete and perfect information about technology and available manpower and material resources. Many experts and specialists stand ready to answer all his questions correctly. "Their voluminous reports accumulate in huge piles on his desk." Now he must choose among an infinite variety of projects in such a way that no more urgent want remains unsatisfied because the necessary means have been diverted to satisfying less urgent wants. Yet despite the vast knowledge available to him, he is unequal to the task.

It might seem, then, that the director's frustration traces to a calculation problem, not a knowledge problem. Yet does the distinction hold? The director cannot even reach the threshold of a comprehensive calculation because he cannot assimilate, all together, all the information that is available to him, in a restricted sense of the word, "in huge piles on his desk." Nor could any committee acting as a single body comprehensively assimilate it all.

If the information is to be used, it must be used in *decentralized* decisions, with prices conveying information to each decisionmaker about parts of the economy beyond his immediate purview. This, it



seems to me, explains Mises's repeated insistence on genuine market prices, including prices of capital and intermediate goods. He repeatedly returned to thinking of *decentralized* decisionmaking and of the indispensable functions (including the informative function) of prices in that context. Except in a most abstract way, he could not keep on conceiving—nor can I—of a central planner or planning board having obtained all the necessary information and having *assimilated* it into a form ready for feeding into a computer for a vast programming exercise.

Nevertheless, if all relevant knowledge *could* be gathered and assimilated and all other preparations made and if the vast comprehensive calculation *could* be performed, then the immense list of results spewed from the computer would not only prescribe all input and output quantities in detail but also indicate shadow prices of all the inputs and outputs. (A modest acquaintance with linear programming makes this point about shadow prices clear.) It would not be necessary to know the prices in advance (and the calculated prices, unlike the calculated quantities, would be of mere academic interest to the planners).

One might object that the shadow prices emerging from such a calculation would not be identical with genuine prices determined in genuine markets (nor would the associated quantities be identical with market results). This is true, but three possible replies are worth noting. First, the vast information fed into the computer might in principle include psychological data on the persons who would otherwise have been entrepreneurs and other participants in genuine markets. This data would bear on how they would have behaved in response to the opportunities and incentives confronting them in real markets. (On the other hand, it is really only a fiction convenient for economic theorists that people have preexisting and fully developed preference functions or "indifference maps" even before experience in actual markets activates them.) Second, socialists presumably do not desire results identical to those of a market economy anyway. Third, the very objection points to some of the advantages of keeping decisionmaking and the use of knowledge decentralized. It shows further recognition that the problem facing socialism would not be one of mere arithmetic.

The necessary preparations for the vast central calculation, let alone the calculation itself, could *not* be accomplished; they are, to use Mises's word, "impossible." It seems perverse, then, to interpret Mises as nevertheless conceding the possibility of all those preparations and of balking only at the possibility of the calculation itself. He was denying the possibility of *economic* calculation, not merely of

*arithmetical* calculation. (Parenthetically, even if we imagine successful mobilization of the data and accomplishment of the arithmetical exercise, vast problems would remain of implementing the results and monitoring everyone's obedience to instructions. Even if the information-conveying function of genuine market prices could somehow be replaced, the incentive function would remain to be somehow performed.)

I submit, then, that even Mises's passage most amenable to the Herbener-Salerno-Rothbard interpretation does not bear out that interpretation on closer examination.

Still, one might ask, if the knowledge aspect was always implicit in his formulation, why didn't Mises make it fully explicit? But how can one know what facts and logical implications, though obvious and as good as explicit to oneself, have escaped other thinkers? One can hardly foresee all of others' misconceptions before they become evident in debate. As Hayek says,

Mises's arguments were not always easily apprehended. Sometimes personal contact and discussion were required to understand them fully. Though written in a pellucid and deceptively simple prose, they tacitly presuppose an understanding of economic processes—an understanding not shared by all his readers. . . . When one reads Mises's opponents, one gains the impression that they did not really see why [economic] calculation was necessary. . . . As a result [of the discussion], Mises became increasingly aware that what separated him from his critics was his wholly different intellectual approach to social and economic problems, rather than mere differences of interpretation of particular facts. (1922/1981, p. xxii)

Even so, Mises did make himself clear to quite a few readers, as I shall illustrate.

### **Support from Readers**

Perhaps testimony from my own past self is permissible.<sup>1</sup> I have long had an enthusiastic interest in Mises's arguments about socialist calculation and in the ensuing debates. I first happened onto his *Omnipotent Government* and *Bureaucracy* in 1946 or 1947. I eagerly awaited *Human Action* in 1949 (having already had access to its not readily available German precursor for a couple of hours). I gave a paper on the calculation debate at a faculty seminar at Texas A & M

<sup>1</sup>I thank—or blame—Roger Garrison for persuading me to shift this personal testimony from the end to the beginning of this section.

College (now University) in November 1949. For some time, before finally choosing a different topic, I considered writing my Columbia Ph.D. dissertation on a related problem of socialism. During several years of teaching a course in general-equilibrium theory at the University of Virginia, I used Mises's argument and the whole socialist-calculation debate to illuminate general interdependence and the various tasks to be accomplished somehow or other in any economic system. The conventional wisdom about Oskar Lange's having refuted Mises's argument never deceived me.

And I never understood that argument to be about calculation in the narrow arithmetical sense. I always understood Mises to be referring to the informational and other functions of prices that do get performed in a genuine market economy and that could not be performed or adequately replaced in a socialist economy. I always understood Hayek to be elaborating on ideas that were clearly implicit if not always totally explicit in Mises's work; I never dreamed that the issue might arise of a clash between their positions.

Hayek has long recognized Mises's concern with the use of knowledge—"of all the relevant facts." Mises, he says, provided

the detailed demonstration that an economic use of the available resources was only possible if . . . pricing was applied not only to the final product but also to all the intermediate products and factors of production, and that no other process was conceivable which would take in the same way account of all the relevant facts as did the pricing process of the competitive market. (Hayek 1935, p. 33)

Georg Halm stated Mises's argument as follows: The socialist authority would know various things, "*but it would not know how scarce capital was. For the scarcity of means of production must always be related to the demand for them, whose fluctuations give rise to variations in the value of the good in question*" (1935, pp. 162–63, also quoted in Rothbard 1991, p. 62).

Oskar Lange, whom Mises's arguments prodded to invent a sketch of "market socialism," interpreted Mises as having traced the impossibility of rational socialist planning largely to inaccessibility of necessary "data." Lange countered that "The administrators of a socialist economy will have exactly the same knowledge, or lack of knowledge, of the production functions as the capitalist entrepreneurs have" (1938, pp. 60–61).

Lange thought he had refuted Mises by showing that an artificial market would render calculation possible, says Jacek Kochanowicz (introduction to Mises 1990, pp. xi–xii). Presumably following Mises

on what calculation meant, then, Lange did not interpret it as merely accomplishing a task in arithmetic.

Incidentally, Lange (1938, p. 61) accused Mises of confusing two senses of the term "prices," "the exchange ratios of commodities on a market" and the wider sense of "terms on which alternatives are offered." Not so: Mises did not need the distinction. He did not believe it possible to obtain meaningful prices of either kind except through genuine market processes.

Solomon Fabricant recognizes the role of knowledge in Mises's argument. "[I]n a free society, as was pointed out above all by Mises and Hayek, individuals have the authority and the incentives to use the particular knowledge which they—and only them—possess to adapt most economically to the incessant changes that go on in a dynamic world. This stock of knowledge includes detailed information that no central authority could ever hope to gather, digest and apply in formulating its plans and making its decisions" (1976, pp. 30–31; one footnote is not quoted here).

Trygve Hoff mentions knowledge in interpreting Mises's argument: Without prices for the means of production, "the central authority will lack the necessary data to determine how and in what combination the various means of production can be put to the optimum use. . . . Without prices for means of production the central authority will have no data for determining whether the contribution and the sacrifice are greater or smaller than the result" (Hoff 1938/1981, pp. 202–3; further remarks about "data" occur on pp. 223 and 288).

Karen Vaughn attributes to Mises the "vehement assertion that the information necessary for economic calculation could be obtained only through market-determined prices." In 1935, Hayek "expanded upon Mises's original contention that economic calculation is impossible without market prices to provide relevant information." "Following Hayek and Mises, Hoff notes that . . . [a] central planning board necessarily lacks . . . vital market information" indicated by prices (Vaughn, introduction to Hoff 1938/1981, pp. xi, xvi, xxx).

Don Lavoie, writing before Rothbard, Salerno, and Herbener had tried to distinguish between the positions of Mises and Hayek, repeatedly says that they were expounding the same position. Hayek elaborated on some of Mises's points, especially ones about knowledge and on the necessity of genuine rivalrous markets for capital goods and other factors of production so that the factor prices established there could convey essential information. Contrary to the standard account of the socialist-calculation debate, Mises and Hayek did not shift their ground. They did change their emphasis to respond to

suggestions for market socialism after the socialists, or some of them, had shifted *their* ground.

It would be tedious to quote all the passages in which Lavoie recognizes the essential identity of Mises's and Hayek's positions. I refer the reader, in particular, to pages 15 n., 21, 24, 26, chapter 3 (entitled "Mises's Challenge: the Informational Function of Rivalry"), pages 87, 89, 91–92, 102, 114–15, 123, 145, 160–61, 173 n., 177–78, and 180. Consider, however, these two passages: "The entrepreneurial market process . . . generates the continuously changing structure of knowledge about the more effective ways of combining the factors of production. This knowledge is created in decentralized form and dispersed through the price system to coordinate the market's diverse and independent decisionmakers. There is no way, Mises claimed, in which this knowledge can be generated without rivalry" (Lavoie 1985, p. 24). Hayek's improvements of Mises's argument "should be understood as essentially an elaboration of the meaning that Mises originally attached to his own words" (Lavoie 1985, p. 26).

Lavoie makes a useful distinction between economic *calculation*, the problem that Mises addressed, and mere *computation*, the arithmetical aspect (1985, pp. 91, 119, 122, 128, 133, 144, 160, 168 n., 182, and *passim*).

Yuri Maltsev hails Mises's demonstration of 1922 that

Socialist planning . . . is *logically impossible* because the system cannot provide the knowledge required to determine which production projects are desirable and feasible and which are not. Only the market, with what Mises called its "intellectual division of labor," can generate that knowledge and put it in a usable form. (Foreword to Boettke 1990, pp. xii–xiii)

Peter Boettke repeatedly notices the role of knowledge in Mises's argument; for example:

Implicit in Mises's logical chain of reasoning is the recognition that no one mind or group of minds could possess the necessary knowledge to plan the economic system. . . . Mises states this knowledge problem in his original challenge. . . . [A]s Mises notes, market exchange and production within a monetary economy provide for the discovery and dissemination of the knowledge necessary [for coordinating computations]. (Boettke 1990, p. 23, and compare pp. 24, 26, 28, 123, 170–71, 195)

Joseph Persky (1991, p. 229) reads Mises as "emphasiz[ing] that a collectivist state would have great difficulty in gathering and

acting on relevant information; therefore, under socialism, even well-intentioned bureaucrats would lack a meaningful system of values on which to calculate."

Robert L. Heilbroner, who had long expressed sympathy for socialism, has recently acknowledged that Mises was right all along. The few economists who early predicted disaster from central planning were led, Heilbroner says, by "Ludwig von Mises and Friedrich Hayek. . . . Their diagnosis was based on the inability of a planned system to generate the *information* needed to bring into being, or to maintain in being, a properly interlocking economic system. This information is automatically generated by a market mechanism that every day 'informs' its individual participants whether their activities are wanted by other participants or not, but no substitute for this information network, or for the motivation to put the information to work, exists in a system in which a cumbersome bureaucracy tries to play the role of a competitive marketplace" (Heilbroner 1991, p. 114, emphasis in original).

Perhaps surprisingly, Murray Rothbard also lends support to my interpretation. "The fact that in a changeless world of perfect knowledge and general equilibrium a Social Planning Board could 'solve' equations of prices and production was for Mises a worse than useless demonstration. Clearly, as Hayek would later develop at length, if complete knowledge of economic reality is assumed to be 'given' to all, including a Planning Board, there is no problem of calculation or, indeed, any economic problem at all, whatever the economic system. The Mises demonstration of the impossibility of economic calculation under socialism and of the superiority of private markets in the means of production applied only to the real world of uncertainty, continuing change, and scattered knowledge" (Rothbard 1976, p. 68).

Rothbard cites Mises's refutation of Oskar Lange's idea (1938) that a socialist planning board could arrive at correct prices, even of capital goods, through trial and error. He mentions "signals," clearly implying they convey information: "the process of trial and error works on the market because the emergence of profit and loss conveys vital signals to the entrepreneur, whereas such apprehensions of genuine profit and loss could not be made in the absence of a real market for the factors of production" (Rothbard 1976, p. 71).

Admittedly, Rothbard seems to have changed his mind later. Yet as recently as in his 1991 article (p. 52, emphasis supplied here), he paraphrases Mises as asking the following about the socialist planners:

How would they *know* what products to order their eager slaves to produce, at what stage of production, how much of the product at each stage, what techniques or raw materials to use in that production and how much of each, and where specifically to locate all this production? How would they *know* their costs, or what process of production is or is not efficient?"

Rothbard continues recognizing the knowledge aspect of the problem:

Mises points out that while the government may be able to know what ends it is trying to achieve, and what goods are most urgently needed, it will have no way of knowing the other crucial element required for rational economic calculation: valuation of the various means of production, which the capitalist market can achieve by the determination of money prices for all products and their factors. (1991, p. 63)

Even a perfectly knowledgeable person, says Salerno (1990, Postscript, p. 53) "would be unable to even achieve a full intellectual 'survey' of the [planning] problem in all its complexity." But doesn't this mean: unable to pull together all the scattered relevant knowledge? Salerno notes, approvingly, that Mises recognized the necessity of an "intellectual division of labor" (Ibid., p. 54). This is another allusion to the impossibility of centralizing all the scattered relevant knowledge.

Even if the planners had various other knowledge, the central planners would be unable "to ever know or guess the 'opportunity cost' of any social production process" (Ibid., p. 55).

## Conclusion

Just what was Mises's position? Salerno briefly but correctly restates it: "without private ownership of the means of production, and catallactic competition for them, there cannot exist economic calculation and rational allocation of resources under conditions of the social division of labor. In short, socialist economy and society are impossible" (Ibid., p. 66). This formulation leaves room to be amplified. It does *not* focus merely on immense arithmetic difficulties at the stage of calculation in the strictest sense of the term, conceding that the planners might accomplish their task right up to that stage. I challenge readers who insist on distinguishing between calculation and knowledge problems to find passages in which Mises can reasonably be interpreted as making that distinction and expressing concern only with calculation but not with knowledge.

To deny that Hayek was elaborating on what Mises said about economic calculation and to maintain that Hayek was saying something distinct and even incompatible is to truncate and misrepresent what Mises did say. To cut away all aspects of his message on which Hayek elaborated is to trivialize his message, quite inaccurately, into a proposition about arithmetical exercises.

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