CHAPTER V

THE UNJUSTIFIED SHIFT IN THE DEBATE TOWARD STATICS: THE ARGUMENTS OF FORMAL SIMILARITY AND THE SO-CALLED "MATHEMATICAL SOLUTION"

In this chapter, we will see that once Mises issued his initial challenge, the socialist participants in the debate quickly centered their efforts on solving the problem socialism would pose in a strictly static sense. These efforts were totally unnecessary, and thus we describe this shift of the socialist theorists toward statics as "unjustified," given that Mises himself had already indicated that socialism did not present any problem of economic calculation at all in static terms. We will attempt to explain why the socialists so completely misunderstood the nature of the problem to be discussed. Specifically, we will analyze the destructive effect exerted on the debate by both the paradigm of economic equilibrium analysis and the arguments developed to show the formal similarity which exists in strictly static terms between the market and the socialist model. Then we will examine the "mathematical solution," which socialist theorists proposed in several versions, and wind up the chapter with an analysis of the response Mises, Hayek, and Robbins gave to this whole set of "solution" proposals.

1. THE ARGUMENTS OF FORMAL SIMILARITY

In the last chapter, we saw that the longest-standing school of thought within the socialist tradition naively maintained that a socialist system could dispense with the economic concepts of value and interest, which classical theorists had discovered and analyzed for capitalist economies. In response to this position, different economists hastened to show that even in an ideal socialist economic regime, with all information available and no changes (equilibrium model), the basic concepts of value and interest would have to be conserved. This argument, which was initially formulated in terms of verbal logic and later in highly formalized mathematical terms, sprang from a desire to make an impression upon the socialist theorists

who unrealistically believed it was possible to do away with the concept of value in their models. Thus, to demonstrate that the ideal communist system required the basic concepts of value and interest even in equilibrium, economists made the theoretical concession of considering from the beginning that the fundamental economic problem (i.e. acquiring the necessary information) had already been resolved. However, it was this concession which led to the unwarranted shift in the debate toward the field of statics, where it was meaningless, and as a result, great confusion arose among the debate's participants and among those who later analyzed and evaluated its content and the main conclusions to be drawn from it. Indeed, when the assumption was made in equilibrium models, whether formalized in mathematical terms or not, that all information was available and unchanging, it became almost inevitable to consider the problem of socialist economic calculation as merely an algebraic or *computational* problem, which could be overcome by simply finding a practical procedure for solving the corresponding systems of mathematical equations. Hence, *the argument of formal similarity, which was originally conceived to refute the claims of socialist theorists, was later used by them to evade the fundamental economic problem posed by socialism* (i.e. how the central planning agency can obtain the crucial, practical information it needs, data which is always dispersed throughout the minds of millions of economic agents). Thus, economists committed the error of viewing the problem as simply the practical difficulty of solving numerous and complex systems of equations, without ever perceiving that socialism presents any other problem of theoretical impossibility per se. As this phenomenon perfectly illustrates, the great danger of applying the mathematical method in economics is that it renders the truly important economic problems indistinguishable to even the most brilliant minds.[1]

[1] Although Mises considered the mathematical method devastating, regardless of the area of economics in which it is applied, perhaps the issue of economic calculation most clearly revealed to him that the mathematical method simply fails to take account of market processes and conceals the fundamental theoretical problem of socialism, i.e. how society can be coordinated when the free exercise of entrepreneurship is prevented. Thus, it is understandable that he asserted, with equal courage and severity: "The mathematical method must be rejected not only on account of its barrenness. It is an entirely vicious method, starting from false assumptions and leading to fallacious inferences. Its

The Formal Similarity Arguments Advanced by Eugen von Böhm-Bawerk and Friedrich von Wieser

Eighteen eighty-nine was perhaps the most significant year with respect to formal similarity arguments. Indeed, that year saw the publication of Friedrich von Wieser's book, *Der Natürliche Wert* [*Natural Value*]. One of Wieser's primary objectives for the book was to show that even in a community or state organized economically according to communist principles, economic goods would not cease to have value. Wieser believed the essential laws of value to be independent of any institutional and social environment, and that therefore they must be taken into account in any socialist system. Wieser's is clearly an analysis of equilibrium which reveals that the characteristic logic of choice must be identical in a market system and in a socialist system, and this precisely constitutes the argument of a formal similarity between the two systems.[2]

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syllogisms are not only sterile; *they divert the mind from the study of the real problems and distort the relations between the various phenomena*." Ludwig von Mises, *Human Action*, 350.

[2] Friedrich von Wieser, *Der Natürliche Wert* (Vienna: A. Hölder, 1889). There is an English translation by C.A. Malloch, *Natural Value* (New York: Augustus M. Kelley, 1971). On page 60 of this edition, we read: "Even in a community or state whose economic affairs were ordered on communistic principles, goods would not cease to have value … That value which arises from the social relation between amount of goods and utility, or value as it would exist in the communist state, we shall henceforth call 'Natural Value.'" We have given this book a careful reading and personally find Wieser's concept of "natural value" absurd and phantasmagorical. It is a concept of value which can only be applied to a hypothetical equilibrium model which is never actually realized. As a result, Wieser commits the error of assuming that value is objective; specifically, he considers interpersonal comparisons of utility possible. Wieser would have avoided this and other grave errors in his book if, more in keeping with the true "Austrian" tradition Menger began, he had based his analysis on the study of dynamic market processes and not on the phantasmagorical model of equilibrium. Thus, Mises strongly criticizes Wieser for abandoning and betraying the paradigm Menger initiated, which focuses on the general and interrelated study of market processes. Mises concludes that Wieser: "was not a creative thinker and in general was more harmful than useful. He never really understood the gist of the idea of subjectivism in the Austrian School of thought, which limitation caused him to make many unfortunate mistakes. His imputation theory is untenable. His ideas on value calculation justify the conclusion that he could not be called a member of the Austrian School, but rather was a member of the Lausanne School (Leon Walras et al. and the idea of economic equilibrium)." Ludwig von Mises, *Notes and Recollections*, 36. Wieser's deviationism is completely overlooked by Mark Blaug in the following comment, in which he nonetheless brilliantly and concisely defines the unique Austrian perspective: "The Austrians at one and the same time rejected Marshall's partial equilibrium analysis and the kind of economics that Walras advocated, which was, in the first place, an economics explicitly formulated in mathematical terms and, in the second place, an 'end-state' rather than a 'process' economics, that is, one that focused attention on the nature of equilibrium outcomes and not on the process by which equilibria are attained. The Austrians had no sympathy for Walras' analysis of the existence and uniqueness of multimarket equilibrium in terms of the metaphor of simultaneous equations and even less for his discussions of multimarket equilibrium in terms of price adjustments to net excess demand. Indeed *all* Austrians, including Wickstead and Robbins, eschewed the very notion of a determinate theory of pricing and underlined discontinuities and indivisibilities, *being perfectly content with a general tendency toward equilibrium that is never in fact completely realized*." Mark Blaug, "Comment on O'Brien's 'Lionel

Also in 1889, Eugen von Böhm-Bawerk, in the second volume of his magnum opus *Capital and Interest*, developed an argument quite similar to Wieser's, but in reference to the interest rate. Böhm-Bawerk views interest as an essential economic concept which must be present in any economic system, whether capitalist or communist. Hence, the fiercely criticized "surplus value" or "exploitation" typical of the capitalist system would not disappear under a socialist regime. In fact, quite the opposite is true: the state or supervisory agency would be obliged to maintain it, since the concepts of time preference and interest cannot be eliminated from any economy.[3]

Although these contributions were intended to show that the categories of value and interest must also exist in a socialist regime, when Wieser and, to a lesser extent, Böhm-Bawerk based their reasoning on equilibrium arguments which presuppose that all necessary information is given, they made it relatively easy to incorporate their viewpoint into the neoclassical paradigm. This paradigm centers on equilibrium and defines the problem of socialist economic calculation as merely one of operating technique, of solving a very large number of highly complex equations. However, we must state, in defense of these Austrian authors, that at least they were aware that the model they were using would be very difficult, if not impossible, to actually put into practice. Specifically, in 1914, Wieser even *intuited* Mises's essential argument with respect to socialist economic calculation and the impossibility of the central

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Robbins and the Austrian Connection,'" in *Carl Menger and His Legacy in Economics*, ed. Bruce J. Caldwell, 186. Incidentally, we should note that Mark Blaug underwent a much-talked-about conversion. He began by dismissing the Austrian school out of hand, but later came to renounce his faith in the general equilibrium model and the Walrasian neoclassical paradigm and concluded: "I have come slowly and extremely reluctantly to view that they [the Austrian school] are right and that we have all been wrong." *Appraising Economic Theories*, ed. Blaug and De Marchi (London: Edward Elgar, 1991), 508. See also his less emphatic *Economics Through the Looking Glass*, Occasional Paper 78 (London: Institute of Economic Affairs, 1988), 37. See also *The Economic Journal* (November 1993): 1571.

[3] See footnote 39, chapter 4, where we outline all of Böhm-Bawerk's arguments against the Marxist theory of exploitation. Specifically, Böhm-Bawerk concludes: "Income from capital is today reviled by the socialists as an exploitational gain, a predacious deduction from the product of labor. *But it would not disappear under socialism*. On the contrary, the socialistically organized state would itself be the one to maintain it in full force as against the workers – and it would be compelled so to maintain it … Nothing in the world can or will change the fact that possessors of present goods, when they exchange them for future goods, obtain an agio … Interest is proven to be an economic category which arises from elemental economic causes and hence will appear everywhere, irrespective of the type of social or juridical organization, provided there exists an exchange of product for future goods." *Positive Theory of Capital*, vol. 2 of *Capital and Interest*, section 5 ("Interest under Socialism"), 345 and 346.

planning agency's obtaining the necessary practical information. In fact, Wieser stated: "The private economic system is the only historically tried form of a large social economic combination. The experience of thousands of years furnishes proof that, by this very system, a more successful social joint action is being secured, than by *universal submission to one single command*. The one will and command which, in war and for legal unity, is essential and indispensable as the connecting tie of the common forces, detracts in economic joint action from the efficacy of the agency. In the economy, though it has become social, *work is always to be performed fractionally* … Part-performances of this sort will be executed far more effectively by thousands and millions of human beings, *seeing with thousands and millions of eyes*, exerting as many wills: they will be balanced, one against the others, far more accurately than if all these actions, like some complex mechanism, had to be *guided and directed by some superior control. A central prompter of this sort could never be informed of countless possibilities*, to be met in every individual case, as regards the utmost utility to be derived from given circumstances or the best steps to be taken for future advancement and progress."[4]

Enrico Barone's Contribution as a Formal Similarity Argument

In the first section of the last chapter, we commented on certain aspects of Enrico Barone's 1908 piece, "Il Ministro della Produzione nello Stato Colletivista," which F.A. Hayek later translated into English and published in his *Collectivist Economic Planning*.[5] Of interest to us now is the way in which Barone followed Wieser's lead in terms of developing the arguments of a formal similarity between capitalism and socialism. The main novelty of Barone's position lay in his criticism of what he considered the awkward and vague nature of the formal similarity arguments employed by his predecessors (Wieser and, to a lesser degree, Böhm-Bawerk). Barone went so far as to claim he was capable of rigorously and formally presenting and proving, using mathematical analysis, what until then had been only an imperfect

[4] Friedrich von Wieser, *Social Economics* (New York: Augustus M. Kelley, 1967), 396-397. This work is the English translation by A. Ford Hinrichs of *Theorie der Gessellschaftlichen Wirtschaft* (Tubingen: J.C.B. Mohr, 1914).

intuition.[6] However, we must take issue with this presumptuous statement of Barone's, since we believe that so-called mathematical precision can only be achieved at the expense of nearly all of the model's remaining significance and explanatory value from the standpoint of economic analysis. Indeed, unlike Wieser, Barone does not conceive the economy as a social process consisting of a set of interrelationships between different agents who act consciously to pursue their ends; instead, he conceives it as simply a set of functional relationships and quantitative results. What was a more or less rigorous, genetic-causal economic analysis, rooted in each actor's ends and means, becomes a mechanical set of functional relationships in which human beings do not take part, time does not count, and "prices" are not the result of human interaction, but emerge from the intersection of two curves or are mere numerical solutions to a simultaneous system of equations. Thus, Barone clearly illustrates the effects of the corrupting colonization of economics by the body of engineers and technicians trained in the mechanistic tradition of Laplace. As a result, it is not surprising that Barone's analysis is necessarily and essentially static and therefore irrelevant from the standpoint of Mises's criticism of socialism. In fact, for the first forty pages of his article, Barone assumes that the necessary information, with respect to the amount of capital as well as the technical relationships between the different factors of production and the tastes and ends of individuals, is given and known.[7] As we saw in the first section of the last chapter, it is only at the end of his article that Barone, very vaguely and in passing, indicates that the information he initially assumed to be available to enable him to formally develop his argument in mathematical terms could never be known.

Therefore, it is obvious that, contrary to the erroneous interpretation of the debate which has until now prevailed due to the clumsy and opportunistic description of it given by Oskar Lange and J.A. Schumpeter, Enrico Barone in no way refuted Mises's argument concerning the impossibility of socialist economic calculation before Mises had even formulated it. Indeed, as

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[5] See footnote 9, chapter 4.
[6] See pp. 257-258 of *Collectivist Economic Planning*, edited by F.A. Hayek.
[7] *Collectivist Economic Planning*, 247.

we have already shown by explicitly citing Mises,[8] his argument is dynamic and refers to the impossibility of the central agency's obtaining the vital practical information it needs to plan the economy. Hence, Mises himself was the first to note that in the imaginary nirvana of equilibrium, it would not be necessary to even consider the problem he had pointed out. Thus, Barone did not refute Mises's argument, since in his formal similarity analysis, Barone begins precisely by assuming that the necessary information is given and that the economic problem Mises identified has been resolved *ab initio*. Not only did Barone not refute Mises's argument, but, on the contrary, at the end of his article, Barone explicitly stresses, though in a superficial and vague manner, the fundamental idea which would later lie at the heart of the Misesian argument, i.e. that it is logically impossible to acquire, by a mechanism other than by observing the result of market processes themselves, the knowledge assumed given in order to formulate the corresponding system of mathematical equations. As we have already seen, Pareto himself had conveyed this idea with perfect clarity before even Barone.[9]

Other Formal Similarity Theorists: Cassel and Lindahl

The above formal-similarity arguments were brought together in 1918 by Cassel, who, with respect to both price determination and the maintenance of the interest rate, viewed the situation in a socialist economy as formally similar to that in a market economy. Cassel even stated that "the principles of price formation are valid for the whole economy, and specifically, are independent of the particular organization of production." He also considered so-called perfect competition "highly necessary as a theoretical condition for implementing the principle of setting price according to cost." All of the above led Cassel to conclude that the "socialist order can be considered theoretically simpler" even than the market itself. Cassel's ideas exerted a very negative, indirect influence on the course of the debate, because they provided the theoretical basis for Kläre Tisch's doctoral thesis, which Schumpeter supervised in 1932, and which contributed greatly to convincing him that the formal similarity theorists (Pareto,

[8] See Mises's own words cited in the text above footnotes 29 and 30 of chapter 4.

Barone, etc.) had already resolved, before Mises himself, the problem of economic calculation Mises raised. Cassel's ideas survived for years among his disciples, and even in 1939, Erik Lindahl continued to blindly defend formal similarity arguments, while overlooking all that the debate on socialist economic calculation had contributed up to that point.[10]

2. ANALYSIS OF THE "MATHEMATICAL" SOLUTION

Earlier, when we interpreted the contribution of Marx, we established that his ideal model of society could ultimately be considered an equilibrium model which he felt it possible and advisable to coercively impose via a central planning agency. Later, we saw that different theorists developed the formal conditions of this equilibrium model and, by assuming that the fundamental economic problem of obtaining information had been resolved *ab initio*, they led different authors to believe that socialism simply posed an algebraic problem of mathematically solving a more or less complex system of numerous equations. Thus, it gradually became common to think that the theorists who saw a formal similarity between capitalism and socialism (Wieser, Barone, etc.) had proven that, contrary to what Mises indicated, socialist economic calculation was "theoretically" possible, and that if it presented a difficulty, it was only the algebraic difficulty of solving the corresponding systems of equations. However, we have shown this interpretation to be completely erroneous from beginning to end. To equate

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[9] See footnote 8 of chapter 4.

[10] Erik Lindahl, *Studies of the Theory of Money and Capital* (1939) (New York: Augustus M. Kelley, 1970). Lindahl devotes an entire section to the "Pricing Problem in a Community with a Centralized Planning" (pp. 69-73) and concludes that "the Central Authority will have to solve a problem of exactly the same nature as the Central Bank in a community with free entrepreneurship." We must especially criticize Lindahl's "dynamic" analysis which, because it implies that the information which is at any moment crucial is given, constitutes, more than anything else, a purely static analysis, in which the variables and parameters simply refer to different points in "time," understood in a deterministic or Newtonian sense, and in which, therefore, the concepts of uncertainty, a lack of information, and the creative power of human action and entrepreneurship are conspicuous by their absence. Lindahl follows the tradition of the formal similarity arguments which Gustav Cassel developed in 1918 and which we have already discussed in the text. Gustav Cassel, *Theoretische Sozialökonomie* (Leipzig, 1932). S.L. Barron has performed a good English translation entitled *The Theory of Social Economy* (New York: Augustus M. Kelley, 1967). [Cassel's own words, where cited in the text above, have been translated from the Spanish version, *Economía Social Teórica*, trans. Miguel Paredes (Madrid: Editorial Aguilar, 1960), 101-105, 202-205.] See also footnote 18 and the criticism George Halm levels against Cassel in "Further Considerations on the Possibility of Adequate Calculation in a Socialist Community," printed in *Collectivist Economic Planning*, 184-186.

economic theory with equilibrium analysis is unacceptable and absolutely unwarranted, since, in any case, equilibrium analysis is only one part of economic theory (perhaps the least vital part). As we have already demonstrated, Mises's analysis is a *theoretical analysis*, but, in the best Austrian tradition, it concerns dynamic social processes, and consequently, the impossibility of centrally acquiring the key practical information which economic agents possess, use, and constantly create. Therefore, the problem is not, as many conclude, that even if the central agency were to obtain the necessary information, calculation would still be impossible, due to the enormous practical difficulty of algebraically solving the corresponding systems of equations. On the contrary, we should approach the problem from precisely the opposite direction: *even if at some point it became possible to solve the extremely complex and numerous systems of equations presented by the formal similarity theorists, the insurmountable theoretical and logical problem of acquiring the information crucial for formulating these equations would always remain*. Hence, the shift the formal similarity theorists initiated toward statics in the debate concealed from many brilliant minds the nature of the fundamental economic problem Mises had raised concerning socialism, and it prompted the false belief that economic calculation could be made possible simply by improving the algebraic techniques of solving the corresponding systems of equations. We will now examine the contents of the most important proposals of a "mathematical solution."

The Article by Fred M. Taylor

The first serious attempt to mathematically solve the problem of central planning was undertaken by Fred M. Taylor in a lecture entitled "The Guidance of Production in a Socialist State," delivered December 27, 1928, on the occasion of his inauguration as president of the American Economic Association.[11] Taylor's brief, ambiguous article divides the analysis of the

[11] This was the presidential address given at the forty-first annual meeting of the American Economic Association in Chicago, Illinois on December 27, 1928. The speech was later published by the *American Economic Review* 19, no. 1 (March 1929). The article also appeared in *On the Economic Theory of Socialism*, ed. Benjamin E. Lippincott (New York: McGraw Hill, 1964), 41-54. It is curious to note that Fred Manville Taylor (1855-1932), who is no relation to Frederick Winslow Taylor – the author

economic calculation problem into two parts. In the first, he explicitly supposes that all necessary knowledge or information is available; and in the second, which is very short, he attempts to design a system for discovering this information.

Taylor's paper was the first return, after Mises, to static or equilibrium analyses, in which it is presumed that all necessary information is available, and therefore, that the economic calculation problem is merely an issue of computation or mathematical technique. According to Taylor, economic calculation could be performed using arithmetical tables, which he called "factor valuation tables" and which would contain, in quantitative terms, the relative valuations of all factors of production. Taylor believed socialism should be organized based on the sale of each good and service at a price which coincides with its respective cost of production, to be calculated using the above tables. Given that Taylor, throughout most of his article, explicitly supposes that the authority of the socialist state could have available to it sufficiently accurate numerical data to formulate these tables, he obviously begs the question, because he implicitly bases his reasoning on the assumption that the fundamental economic problem socialism presents can be solved. Hence, Taylor was the first to commit the distinct error which the vast array of socialist writers would commit: in an attempt to evade the truly vital dynamic concerns involved in socialist economic calculation, he centers his analysis on the strictly algebraic or mathematical concerns typical of the static equilibrium model.

As Gerald P. O'Driscoll pointed out, the chief error all of these writers commit lies not in the type of answer they give to the problem, but rather in the question they ask.[12] Indeed, the

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of *The Principles of Scientific Management* – was a great defender of laissez faire and the gold standard, but his methodological leaning toward equilibrium analysis (in his case partial and Marshallian) inexorably led him to assume that the problem of economic calculation could be resolved without much trouble.

[12] Gerald P. O'Driscoll, in his article, "A Tribute to F.A. Hayek," *The Cato Journal* 9, no. 2 (fall 1989): 345-352, states: "Fundamental advances seldom come through providing new answers to old questions. *Fundamental advances occur when someone poses new questions*. What constitutes a lasting contribution in economics is asking a new question, setting a new direction of research … The basic reason most economists did not understand the theoretical argument against socialism is that *they were asking the wrong question*. Hayek's opponents kept asking whether an economic czar could efficiently allocate resources *if he had all the necessary information*. The answer to that question is, of course, "Yes." Hence, in the mythology of economic history the defenders of socialism are credited with having "refuted" Mises and Hayek. The defenders did no such thing, they simply posed and answered a different and irrelevant question" (pp. 345 and 348).

scientifically relevant question with respect to economic calculation is not, as the socialist theorists of the equilibrium model would have it, whether or not it is possible to algebraically solve the corresponding mathematical formulas in the event that all the information necessary to formulate them were available, but on the contrary, whether, from a logical and theoretical standpoint, the information necessary to formulate these equations can be obtained.

Finally, Taylor devotes the last five pages of his article to a very brief proposal of a practical procedure for acquiring, with a certain degree of precision, the information necessary to formulate his "factor valuation tables." Later, we will closely examine the content of his famous "trial and error" method, though at this point we need only to emphasize that Taylor himself saw the first part of his article, on the static analysis of socialism, as the most significant and his main "contribution" to the topic of socialist economic calculation.

The Contribution of H.D. Dickinson

Unlike Taylor's article, which we discussed above and which went practically unnoticed when it was published, the detailed and explicit proposal of a "solution" to the problem of socialist economic calculation that Henry Douglas Dickinson offers in his article, "Price Formation in a Socialist Community," (*Economic Journal*, 1933)[13] sparked the long and heated debate in English on socialist economic calculation, a debate in which, among others, Maurice H. Dobb and Abba P. Lerner participated.

Dickinson starts from the idea that, while in theory it would be quite difficult to formulate a Walrasian system of simultaneous equations, in practice the problem could be greatly simplified by a *grouping process*, by putting together the goods and services which are most closely related. In this way, Dickinson believes it would be possible to establish a system

[13] H.D. Dickinson, "Price Formation in a Socialist Community," *Economic Journal*, no. 43 (June 1933): 237-250. Dickinson (1899-1969) was a student of Cannan's and a professor at Bristol until 1964. David Collard writes: "Dick, as he was universally known, was a much loved, unworldly, eccentric figure with a keen sense of fun and a most astute mind." See the article on this likable figure in economics on p. 536 of *The New Palgrave: A Dictionary of Economics*, vol. 1. Hayek himself shows a certain respect and affection toward Dickinson, even in those places where he most strongly criticizes him.

of equations manageable enough to be mathematically solved through the traditional procedures and without turning to market processes. Curiously, Dickinson makes explicit reference to the "problem" of the dispersed nature of the knowledge involved in market processes, when he states that the ignorance of economic opportunities which is typical in a market economy would be eliminated in a socialist regime, due to the systematic publicizing of the "information" related to production, costs, sales, inventories, and in general, all statistical data which may be relevant. Specifically, Dickinson concludes that in the socialist system, all companies would operate as if made "of glass," that is, without keeping secrets of any kind, and maintaining a complete "information transparency" toward the outside.[14]

These assertions Dickinson makes are as surprising as they are difficult to uphold. Furthermore, his naiveté is comparable only to his ignorance of how a market economy functions. Dickinson fails to understand that the model of general equilibrium, as it was developed by Walras and Pareto, is simply a model of formal similarity in which the only thing its authors reveal is the type of information that would be necessary to establish and maintain a state of equilibrium. However, neither Pareto nor Walras built their hopes up regarding the

[14] Thus, we see that the obsession of socialists and interventionists with "information transparency" can be traced back quite a long time. This notion, which rests on an error of perception as to the type of information used in market processes, has spread and achieved great popularity even in western countries, and it is often embodied in excessive regulations that lay an almost unbearable burden on many companies which are obliged to generate a huge, unnecessary, and costly volume of statistical and accounting "information" which has not even slightly improved the degree of coordination and efficiency of the societies in question. In this area, as in many others, the interests of socialists, who believe that fostering large companies and "information transparency" facilitates their task of coordinating via commands, have converged with those of equilibrium theorists, who believe that an improvement in statistical "information" can facilitate the achievement and maintenance of "efficient" markets, i.e. ones that more closely resemble those of their own models. Moreover, both are supported, as is natural, by the privileged special interest groups which directly benefit from the above regulations (auditors, accountants, accounting professors, registrars of business names, etc.). They are all mistaken in their concept of information, since statistics are always "water under the bridge." They can be interpreted subjectively in the most diverse manners, and not only do they not assist in the entrepreneurial processes of coordination, but they make them more difficult and distort them to the extent that entrepreneurs allow themselves to be influenced by their apparent "accuracy." This is all in addition to the unnecessary cost and poor resource allocation which arise from the coercive imposition of excessive accounting and "information" obligations far in excess of the level business customarily requires. On this topic, see Benito Arruñada's brilliant article, "El coste de la información contable," *España Económica* (May 1991): 8-11, in which he quite rightly criticizes, for this and other reasons, the accounting and business reform introduced at the beginning of the nineties by the socialist government in Spain. See also Stephen Gillespie's article, "Are Economic Statistics Overproduced?" *Public Choice* 67, no. 3 (December 1990): 227-242.

possibility of obtaining the necessary information by procedures other than the market itself.[15] Therefore, the problem is not one of computation; it does not consist of resolving a series of Walrasian simultaneous equations (even if the equations have been formulated in a simplified manner by grouping together the most similar goods and services, as Dickinson proposes), but rather of acquiring the subjective, practical information which is only found and created in a dispersed form and is necessary to establish the parameters and variables of such equations.

As for the argument that dispersed knowledge would present no problem in a socialist system in which the principle of "information transparency" prevailed and all statistics were widely publicized, it is purely fallacious. Information is not *static*, objective, and always available somewhere, such that only cost problems and a deliberate restriction on publicity could keep it from reaching everyone. On the contrary, information is essentially subjective and dynamic and is constantly being created *ex novo* as a consequence of the force of entrepreneurship within the context of a market economy. Hence, if the free exercise of entrepreneurship is prohibited, and the economy is coercively organized from above via commands, as we demonstrated in chapters 2 and 3 of this book, the practical information vital for coordinating the social process will not even emerge or be generated. Therefore, it is worthless to proclaim empty general principles involving "information transparency" or a broader publication of data if the institutional restriction on the free exercise of entrepreneurship precludes the emergence of the necessary information. Moreover, constant change and the dynamic nature of information render existing, historical "information" totally useless and irrelevant. Though it may have been incorporated into lavish and detailed statistics and distributed free of charge with complete transparency, it retains only a historical or "archeological" value if, as occurs in all real, unfrozen economies, circumstances change, new ends and means are discovered, and new information constantly emerges or is created. As early

[15] "It is perfectly true that Vilfredo Pareto and Enrico Barone had shown which information a socialist planning authority would have to possess in order to perform its task. But to know which kind of information would be required to solve a problem does not imply that it can be solved if the information is dispersed among millions of people." F.A. Hayek, "To Pages of Fiction: The Impossibility of Socialist

as 1912, the Dutch economist N.G. Pierson advanced the argument that in a real economy, not even the most widespread and detailed publication of statistics could be of any use, given the constant changes which make statistical information obsolete even before it is published.[16]

Finally, we must conclude by pointing out that only six years later, in 1939, Dickinson himself admitted that although initially (in 1933) he had believed his mathematical solution represented a workable procedure for carrying out economic calculation in a socialist regime, he had later radically changed his mind. He had realized his mistake because "the data themselves which would have to be fed into the equation-machine, are continuously changing."[17] As we know, this is precisely the argument Austrians have offered from the very beginning for their rejection of any sort of "mathematical" solution.

The Mathematical Solution in the German Literature

Various authors tried in the German literature as well to come up with a "mathematical" solution to the problem of economic calculation. Among them, we should highlight Doctor Kläre Tisch, whom we have already mentioned, and who, in her doctoral thesis, which she wrote under the supervision of Joseph A. Schumpeter and based on the work of Cassel and Walras, concluded that it was possible to construct a system of equations with as many equations as unknowns, a system which, once solved, could dispose of the problem of economic calculation. Dr. Herbert Zassenhaus commits the same error, though he himself explicitly recognizes that such a system could only be used if the ministry of production possessed *beforehand* all of the necessary information and this information remained constant while the equations were being solved. Thus, neither Dr. Tisch nor Dr. Zassenhaus realizes that the

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Calculation," in *The Essence of Hayek*, ed. Chiaki Nishiyama and Kurt R. Leube (Stanford, California: Hoover Institution Press, Stanford University, 1984), 58.

[16] "And as regards the fixing of prices, the socialistic state would soon find that no mathematical formula was of any avail, and that the only means by which it could hope to solve the problem were exact and repeated comparisons between present and future stocks and present and future demand; it would find that prices could not be fixed once and for all, but would have to be altered frequently. Not the theory of averages but the value of things in exchange would, in most cases, have to serve as its guide in fixing prices; and why should it reject the services of that guide?" Nicolaas Gerard Pierson, *Principles of Economics*, trans. A. Wotzel (London: Macmillan, 1912), 2:94.

essential problem lies precisely in establishing a way to obtain the information the planning agency needs to formulate its system of equations.[18]

3. THE "MATHEMATICAL SOLUTION" AND ITS ADVERSE CONSEQUENCES FOR THE DEBATE

The most important adverse consequence which the "mathematical solution" proposed by Taylor and Dickinson had on the course of the debate on socialist economic calculation was that it shifted the attention of the participants toward the problems of static economics. Indeed, the "mathematical solution" answers the wrong question (whether or not economic calculation is possible under static conditions, i.e. when all necessary information is available and no changes occur). In this sense, the "mathematical solution" definitely brought down the theoretical standard of the debate, and it distracted minds from the fundamental economic problem as Mises had initially presented it. This fundamental economic problem was basically a theoretical issue of *economic dynamics* and involved the impossibility of performing economic calculation in the absence of a market process driven by entrepreneurship, since entrepreneurship alone enables economic agents to constantly discover the practical, dispersed information which is necessary to make market estimates on costs and benefits.

Another negative consequence of the "mathematical solution" was that it created the *erroneous impression* that both Hayek and Robbins, in response to the assertions of Taylor and

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[17] Henry Douglas Dickinson, *Economics of Socialism* (Oxford: Oxford University Press, 1939), 104.

[18] The proposal of Dr. Kläre Tisch appears in her doctoral thesis, which was supervised by Joseph A. Schumpeter and is entitled *Wirtschaftsrechnung und Verteilung im Zentralisch Organisierten Sozialistischen Gemeinwesen* (Wuppertal-Elberfeld: University of Bonn, 1932). Hayek views the errors in this doctoral thesis and Schumpeter's ignorance and reverential overestimation of mathematical analysis as the causes of Schumpeter's mistakes in this area, particularly his having devised and propagated (*Capitalism, Socialism, and Democracy* [London: George Allen and Unwin, 1950]) the total myth that, even before Mises himself, Pareto and Barone had managed to resolve the problem of socialist economic calculation. See *The Essence of Hayek*, 59 and 60. As to the contribution of Zassenhaus, it appears in his article, "On the Theory of Economic Planning," *International Economic Papers*, no. 6 (1956): 88-107. This is an English translation of the original, German article, "Über die Ökonomische Theorie der Planwirtschaft," *Zeitschrift für Nationalökonomie* 5 (1934). The proposals of Tisch and Zassenhaus are analyzed in detail and criticized by Trygve J.B. Hoff in his work, *Economic Calculation in the Socialist Society*, 207-210. Also worth reading are the critical observations G. Halm makes regarding the above authors in his article, "Further Considerations on the Possibilities of Adequate Calculations in a Socialist Community," *Collectivist Economic Planning*, 131-200.

Dickinson, withdrew to a "second line of defense" and recognized that economic calculation was possible in theory, yet continued to hold that it was impossible in practice, strictly for reasons of algebraic workability, i.e. because of the practical difficulty of solving the corresponding systems of equations. Apart from the fact that this version of the story rests on the previously described, grave methodological error of equating "theory" with "economic equilibrium analysis," we do not believe it corresponds with reality for the following reasons:

1. First, for Hayek, the essential argument on the impossibility of economic calculation lies not in the practical difficulty of algebraically solving a system of countless equations, but in the insoluble, theoretical-dynamic problem of assuming that the central regulatory agency can acquire the subjective, practical information that is created in dispersed form and found scattered throughout the minds of millions of economic agents. In fact, in his article, "The Present State of the Debate," published in 1935, Hayek writes that the essential economic problem with the mathematical solution is that: "the usual theoretical abstractions used in the explanation of equilibrium in a competitive system include the assumption that a certain range of technical knowledge is "given" … It is hardly necessary to emphasize that this is an absurd idea even in so far as that knowledge is concerned which can properly be said to "exist" at any moment of time. But much of the knowledge that is actually utilized is by no means "in existence" in this ready-made form."[19] Hence, for Hayek, *the fundamental problem economic calculation poses has nothing to do with the strictly "algebraic" difficulty of solving the corresponding system of equations.*

2. When Hayek mentions the practical problem of solving the system of equations, he refers to it as one of a very different nature or rank than the fundamental problem indicated in number one above, and in any case, he attaches only *secondary* importance to it and addresses it almost "in passing" when he states: "Now the magnitude of this essential mathematical operation will depend on the number of unknowns to be determined. The number of these unknowns will be equal to the number of commodities which are to be produced … At present

[19] F.A. Hayek, "The Present State of the Debate," in *Collectivist Economic Planning*, 210.

we can hardly say what their number is, but it is hardly an exaggeration to assume that in a fairly advanced society, the order of magnitude would be at least in the hundreds of thousands. This means that, at each successive moment, every one of the decisions would have to be based on the solution of an equal number of simultaneous differential equations, a task which, with any of the means known at present, could not be carried out in a lifetime."[20] We must also add that, completely regardless of the reasons that computer science cannot solve the economic calculation problem, reasons we examined in chapter 3, if we now focus strictly on the algebraic problem posed by a system of multitudinous equations, we see that the impressive progress in computer techniques and the extraordinary development of computer capacity which have taken place in recent years have proven insignificant in terms of solving the problem. Indeed, according to Samuelson and Nordhaus, with the most modern computers and the techniques H. Scarf and H. Kuhn developed in the 60s and 70s, it is currently possible and relatively easy to solve economic equilibrium problems composed of 50 markets and 10 or 20 different types of consumers. The most modern supercomputers could be used to solve systems of equations based on 100 different types of productive factors, 10,000 goods, and 100 different types of consumers.[21] These magnitudes still come nowhere near the number of different goods and services identifiable in an underdeveloped economy, like that of the former Soviet Union, where the number of products far exceeded 12 million. Sir Alec Nove has mentioned a comment made

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[20] F.A. Hayek, "The Present State of the Debate," in *Collectivist Economic Planning*, 212. This argument parallels the one Pareto put forward in 1897 (see chapter 4, footnote 8).

[21] P.A. Samuelson and W.D. Nordhaus, *Economics*, 12th ed. (New York: McGraw-Hill, 1985). It is commendable that in this edition of their well-known textbook, Samuelson and Nordhaus admit the validity of Hayek's essential argument, when they add in a footnote: "But even if extremely fast computers – thousands of times more powerful than current ones – were produced, we would still have to face another immovable obstacle: *We do not have access to the smallest part of the data necessary to solve a complex problem of general equilibrium*." [Excerpt translated from the Spanish edition: *Economía*, 12th ed. (Madrid: McGraw-Hill, 1986), 830.] It is a shame that Samuelson and Nordhaus relegate this fundamental idea to the end of a footnote and exclude it from the main text of their popular treatise. Furthermore, this essential idea contradicts the content of the book itself [pp. 839 and 840 in the Spanish edition], which includes a brief and terribly confusing summary of the debate and reveals that the authors have not managed to grasp the fundamental economic problem Mises and Hayek explained concerning socialist economic calculation. On top of that, the following statement was still present in the 1989 edition of Samuelson's textbook: "The Soviet economy is proof that, contrary to what many skeptics had earlier believed, a socialist command economy can function and even thrive." This is an embarrassing assertion, at least in light of the events which began to unfold in Eastern Europe that year and the information which, for the first time, surfaced on the real functioning of those economies,

by the academician Fedorenko, who stated that the economic calculation problem which the last five-year plan of the former Soviet Union posed would take 30,000 years to formulate and solve.[22] No matter how unfeasible these figures seem, we must not deceive ourselves by thinking they constitute the fundamental reason for the failure of socialism. For even if tomorrow's computers make it possible to solve systems of hundreds of millions of equations in a tenth of a second, it will always remain impossible to coercively obtain the economic information necessary to formulate such systems of equations.

3. One possible explanation for the misunderstanding of Hayek's position lies in the order in which he presents the points in his argument.[23] Indeed, to criticize the "mathematical solution," Hayek follows an order similar to the one anyone faced with a purely algebraic problem would have to follow. He begins by referring to the problem of formulating the corresponding equations. It is here that Hayek mentions the fundamental theoretical problem: the impossibility of acquiring the information necessary to formulate them. Hayek then writes that, even if we assume for the sake of argument that it has been possible to formulate the equations that describe the equilibrium system, it would be *practically* impossible to

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information provided directly by the interested parties. Paul A. Samuelson, *Economics*, 13th ed. (New York: McGraw-Hill, 1989), 837.

[22] "This is but one of the difficulties attributable to the sheer scale of the required coordination between multimillion plan instructions. Academician Fedorenko quipped that next year's plan, if fully checked and balanced, might be ready in 30,000 years time…" See Alec Nove's article, "Planned Economy," *The New Palgrave: A Dictionary of Economics* (London: Macmillan, 1987), 3:879-885. This excerpt appears on p. 881. Unfortunately, Alec Nove also fails to recognize the fundamental economic problem posed by socialism, and at this point he continues to believe the problem consists merely of the algebraic difficulty of solving the corresponding system of equations. To be specific, Nove writes "by ear" and reveals that he has not read nor understood Mises's essential argument when he states: "Critics, such as Barone and L. von Mises, pointed out some major weaknesses in this approach to socialist planning: *the number of calculations required would be enormous*…" We know that the essential argument Mises voiced against socialist economic calculation is not this one (in fact, Mises never even expressly stated this one), but rather that, even if it were possible to solve inordinately complicated systems of equations, *under socialism the information necessary to formulate them would never be available*.

[23] Don Lavoie, in his outstanding book, *Rivalry and Central Planning*, p. 91, also adds the argument that, in his opinion, Hayek committed a strategic error when he included in his *Collectivist Economic Planning* (1935) his English translation of the article Barone published in 1908, since this article mentioned (and only in passing) that planning based on a Walrasian system of equations was *unfeasible*, mainly due to the difficulties involved in solving the corresponding system of equations. Lavoie was quite right when he concluded: "However, to at least Mises and Hayek if not also Robbins, the problem was *formulating the equations* – not solving them. In a world of complexity and continuous change, the central planners would lack the knowledge of the coefficients that go into the equations" (p. 91).

algebraically solve such a system. Clearly, Hayek focuses on the essential theoretical argument that it is impossible to obtain the information necessary to formulate the corresponding equations, and he attaches only secondary importance to the problem of algebraically solving them.[24] Nevertheless, it is perhaps because he follows the above order in his explanation that many commentators on the debate have mistakenly assumed that Hayek withdrew to a "second line of defense" and hid behind the practical difficulties of solving a system of equations, rather than centering on theoretical arguments of logical impossibility. Such an interpretation is unfounded, and Hayek himself refuted it in detail.[25]

4. Ludwig von Mises is particularly clear in showing that the argument that it would be difficult to algebraically solve the system of equations is not only, as Hayek believed, of a secondary nature, but also totally unnecessary and theoretically irrelevant.[26] For Mises, the fundamental problem is that the knowledge necessary to formulate the equilibrium equations

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[24] Lionel Robbins was perhaps the least clear in terms of emphasizing the merely secondary nature of the argument concerning the practical difficulty of algebraically solving the system of Walrasian equations. It appears that Robbins was so convinced of the absurdity of considering a practical solution of this type that he did not bother to develop and refine the fundamental theoretical argument. Nonetheless, in his defense, we can point to Robbins's observations on economic calculation, which he included though gave secondary importance to, in a book devoted to an analysis of problems of another sort (identifying the causes of the Great Depression). On page 151 of his work, *The Great Depression* (New York: Macmillan, 1934), after stating that "on paper" it is conceivable that the economic calculation problem could be resolved via a series of mathematical calculations, he concludes: "But in practice this solution is quite unworkable. It would necessitate the drawing up of millions of equations on the basis of millions of statistical tables based on many more millions of individual computations. By the time the equations were solved the information on which they were based would have become obsolete and they would need to be calculated anew. The suggestion that a practical solution of the problem of planning is possible on the basis of the Paretian equations simply indicates that those who put it forward have not begun to grasp what these equations mean."

[25] "I feel I should perhaps make it clear that I have never conceded, as is often alleged, that Lange had provided the theoretical solution of the problem, and I did not thereafter withdraw to pointing out practical difficulties. What I did say (in *Individualism and Economic Order*, page 187) was merely that from the factually false hypothesis that the central planning board could command all the necessary information, it could logically follow that the problem was in principle soluble. *To deduce from this observation the 'admission' that the real problem can be solved in theory is a rather scandalous misrepresentation*. Nobody can, of course, transfer to another all the knowledge he has, and certainly not the information he could discover only if market prices told him what was worth looking for." See the article F.A. Hayek published in April of 1982 in *Economic Affairs*, "Two Pages of Fiction: The Impossibility of Socialist Calculation," reprinted as chapter 4 of the book, *The Essence of Hayek*, ed. Chiaki Nishiyama and Kurt R. Leube (Stanford: Hoover Institution, Stanford University, 1984), 58.

[26] In fact, for Mises, "there is therefore *no need* to stress the point that the fabulous number of equations which one would have to solve each day anew for a practical utilization of the method would make the whole idea absurd even if it were really a reasonable substitute for the market's economic calculation. *Therefore the construction of electronic computers does not affect our problem*." Ludwig von Mises, *Human Action*, p. 715 and the last line of footnote 11 on p. 715. Esteban F. Thomsen

can never be centrally available. Furthermore, in 1940 he raised the additional argument, which Hayek had not developed beforehand, that even if a system of equations describing an equilibrium state could be formulated (an impossible feat using the knowledge typical of a state of disequilibrium, the only knowledge available in real life), *it would offer no help at all to the planning or regulatory authorities who must decide what specific decisions or steps would move the economy from the current, real state of disequilibrium to the desired, ideal state of equilibrium*. In the words of Mises himself: "It was a serious mistake to believe that the state of equilibrium could be computed, by means of mathematical operations, on the basis of the knowledge of conditions in a non-equilibrium state. It was no less erroneous to believe that such a knowledge of the conditions under a hypothetical state of equilibrium could be of any use for acting man in his search for the best possible solution of the problems with which he is faced in his daily choices and activities."[27]

4. THE "TRIAL AND ERROR" METHOD

As far back as 1935, Hayek doubted that Taylor and Dickinson really had in mind, as a solution to the economic calculation problem, a method literally based on mathematically solving a Walrasian system of equations. Instead, Hayek believed that what Taylor and Dickinson actually, though ambiguously, proposed was the reiterative search for a solution to the Walrasian system of equations by a procedure based on the "trial and error" method.[28]

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expresses a similar view in his profound work, *Prices and Knowledge: A Market Process Perspective* (London: Routledge, 1992), 83-86.

[27] This brilliant additional argument of Mises's, which has not been refuted, appeared for the first time in German in his *Nationalökonomie: Theorie des Handelns und Wirtschaftens* ([Geneva: Editions Union, 1940], 641-645), in section 4 ("Die Gleichungen der mathematischen Katallaktik") of the chapter he devoted to confuting attempts to solve the economic calculation problem. Previously, in 1938, the essential ideas in this section had been published in French under the title, "Les équations de l'économie mathématique et le problème de calcul économique en régime socialiste." (This article appeared in the *Revue d'Économie Politique* [1938]: 1055-1062, and it was reprinted in the same journal fifty years later in no. 97 [6], November-December, 1987, with a commentary by Jean Bénard which reveals that this author also fails to grasp the economic problems involved in socialist economic calculation.) The argument was later expanded and further elaborated in English in *Human Action*, 710-715.

[28] "It is improbable that anyone who has realized the magnitude of the task involved has seriously proposed a system of planning based on comprehensive systems of equations. What has actually been in the minds of those who have mooted this kind of analysis has been the belief that, starting from a given situation, which was presumably to be that of the pre-existing capitalistic society,

Chronologically, Taylor was the first to expressly mention the "trial and error" method. In fact, for him: "The method of trial and error … consists of trying out a series of hypothetical solutions till one is found which proves a success."[29] Dickinson, for his part, was somewhat less explicit and simply referred to a "process of successive approximation" to the correct solution.[30]

Given the ambiguous and confusing quality of their writings, it is not easy to derive a clear, detailed idea of what Taylor, Roper, and Dickinson understood by "trial and error method," though in principle this method was proposed as a *variant* of the "mathematical solution," an attempt to avoid the thorny problem of having to algebraically solve an extremely complex system of equations. In fact, these authors, as well as Lange himself (as we will see), considered the mathematical solution the most appropriate, yet felt that, as long as practical difficulties to finding the solution to the corresponding system of equations remained, it would be possible to reach a very close approximation by a procedure of "trial and error." It would only be necessary to adopt the "equilibrium solutions" inherited from the preceding capitalist

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the adaptation to the minor changes which occur from day to day could be gradually brought about by a method of trial and error." F.A. Hayek, "The Present State of the Debate," *Collectivist Economic Planning*, 213.

[29] Fred M. Taylor, "The Guidance of Production in a Socialist State," in *On the Economic Theory of Socialism*, 51.

[30] Henry D. Dickinson, "Price Formation in a Socialist Community," 241. Between the proposals Taylor and Dickinson put forward in 1928 and 1933 respectively, in 1931 another American, Willet Crosby Roper, also suggested the trial and error method and believed that successive shortages evident in the economic system would in any case be a clear sign to the central authority that it needed to modify its instructions and would point it toward the "correct" solution. However, although Roper does not hide that he strongly sympathizes with socialism, he is clearly aware of the enormous difficulties that would arise in practice if the trial and error method, which he himself proposes, were applied. Specifically, he states: "This description of the process makes it seem rather simple and easily accomplished. It is a question, apparently, of adjusting a few mistakes at the beginning and then sitting down to watch the system work. But again, *we ignore the almost incredible complication of the economic process* … At the establishment of a price system with perhaps only one or two considerable errors (an almost unbelievable assumption), those one or two errors would involve changes extending through the whole structure. If the number of serious mistakes were greater, it would take a considerable time and a great deal of careful calculation to reach a position of equilibrium, where the factors would be priced exactly according to marginal productivity, where these prices would be equal for factors of equal efficiency, and where the whole theoretical system of stable equilibrium was realised. *As a matter of fact, this equilibrium could be reached only in a static economy which can never exist.* … It seems safe to say that the pricing apparatus necessary for an efficient centralized collectivism is, at best, only a remote possibility." He concludes: "It indicates that the best chance for success of a socialist society lies in a decentralized organization which retains, so far as possible, the strong features of capitalism." Willet Crosby Roper, *The Problem of Pricing in a Socialist State* (Cambridge, Massachusetts: Harvard University Press, 1931), 58, 59, 60, 62.

system and then make the marginal adjustments necessary to "return" the system to equilibrium whenever changes occurred.

The practical way to employ this method would be to order the managers and people in charge of the different sectors, industries, and companies to continually transmit to the central planning agency their knowledge regarding the different production circumstances in general, and the different combinations of productive factors in particular. Based on the information received, the central planning agency would tentatively set an entire series of provisional "prices," which would have to be communicated to company managers, so that they could estimate the quantities they could produce at these prices and act accordingly. The activity of the managers would reveal errors, which would take the form of production shortages (whenever demand exceeded supply) or surpluses (whenever supply exceeded demand). A shortage or surplus in a certain line of production would indicate to the central planning agency that the price established was not correct and that, therefore, it should be appropriately lowered or raised, according to the circumstances. This process would be repeated until the new "equilibrium" so sought-after were found. The highly "praised" method of "trial and error" consists basically of this.

Criticism of the Trial and Error Method

The trial and error method we have just described is not only deceptively "simple," but, for the reasons we will now explain, it is also incapable of resolving the fundamental economic problem socialism poses.

First, it is theoretically absurd to think the real capitalist system could ever reach a state of "equilibrium." In the capitalist system, the prices the parties set are "market prices" which are in constant flux, driven by the creative force of entrepreneurship; they are not "equilibrium prices" which the socialist system can somehow "inherit" as a reliable starting point. Thus, not only do the socialist theorists betray a profound lack of understanding with respect to the way the market works, but paradoxically, they also admit that from the standpoint of their (mistaken) conception, the market, as it is usually "in equilibrium," works much "better" than it actually

does. In contrast, we know that the market is never in "equilibrium" and that, far from an "imperfection," this is the most intimate and typical characteristic of the market. Hence, it is especially pathetic that socialist theorists have had to refrain from criticizing the market for its lack of equilibrium in the tactical interest of presenting a trial and error method which will make socialism possible and which can only conceivably be formulated based on the "equilibrium prices" of the capitalist system they so revile.

Second, it is inadmissible to assume that the changes which would take place in the economic system once it moved from capitalism to socialism would be relatively insignificant. On the contrary, the changes and distortions would inevitably be so major in all economic and social areas that they would necessitate a complete and total restructuring of the entire price system. This would follow from the disappearance of the right to own factors of production and the drastic change in the distribution of income which result from any revolutionary shift from one economic system to another. However, it would also arise from the very altered perceptions of the different economic agents as to the ends they should pursue and the means available to them, in light of the different place each individual occupies on the new social scale and in light of the immense degree of institutional coercion and rigidity introduced, to the detriment of free entrepreneurship in all social areas. Thus, it is theoretically inadmissible to hold that the existing prices in the capitalist economic system just prior to the introduction of socialism could be taken as a starting point, to be followed simply by whatever minor "detail" adjustments are necessary to keep the system in equilibrium.[31]

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[31] F.A. Hayek, "The Present State of the Debate," in *Collectivist Economic Planning*, 213. On this issue, Hayek merely follows the intuition initially developed by Mises, who, back in 1920, stated: "The transition to socialism must, as a consequence of the levelling out of the differences in income and the resultant readjustments in consumption, and therefore production, *change all economic data*, in such a way that a connecting link with the final state of affairs in the previously existing competitive economy becomes impossible." Ludwig von Mises, "Economic Calculation in the Socialist Commonwealth," in *Collectivist Economic Planning*, 109-110. When we connect this reasoning with that presented in footnote 27, we see that the basic argument Mises introduced in 1920 was completed and perfected over a span of twenty years, and the process yielded this version: 1) It is a definite error to believe that the initial conditions correspond with those of a state of equilibrium; 2) It is impossible to calculate the final state of equilibrium due to a lack of information; and 3) Even if one supposes, for the sake of argument, that the above two problems have been resolved, there would be absolutely no guide available to direct the innumerable actions necessary to move from the initial state of equilibrium to the final state of equilibrium (the culmination of Mises's argument; see footnote 27).

Third, even if we imagine, for the sake of argument, that the change from capitalism to socialism does not significantly affect the price system, it is important to remember that only in rare cases could a product surplus or shortage reliably indicate to a central planning agency what it should do with the price. Specifically, the different economic agents must have choices and perceive them as such if a product shortage or surplus is to indicate whether or not it is necessary to raise or lower the prefixed price. In other words, wherever alternatives do not exist or are not perceived, shortages have little meaning, since they are forced by the lack of, or the lack of knowledge of, goods and services which are similar, but of different quality, or available at different prices, or even goods and services which are different, yet to some extent can be used as substitutes. Hence, a shortage is not a symptom which automatically indicates that the price should be raised, since on many occasions the most economical course of action would be to attempt to develop, introduce, and try new, alternative products.

Fourth, for a shortage to be significant and in any way assist the central planning agency in making decisions, it is also essential that the number of "vouchers" issued to convey the right to acquire factors of production and consumer goods and services not be excessive. (We do not say "monetary units," since, as we have explained before, the concept of money differs radically from a socialist system to a capitalist system.) Indeed, if too many "monetary" units are issued, there will be a generalized "shortage" of goods, services, and productive resources, and this shortage will not provide any precise indication of how much the price of each good, service, or factor of production should be raised, nor by what amount the production of each type of these should be increased.[32]

Fifth, if, as is most common, the shortage ends up manifesting itself as a chronic or recurrent feature of the socialist system, the economic agents (consumers, managers, etc.) will sooner or later learn from experience, and their own innate "entrepreneurial" ability will lead them to try to obtain any good obtainable in exchange for the corresponding "monetary units."

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[32] Trygve J.B. Hoff very graphically explains that "just as in tennis a score of 6-0, 6-0 gives no indication of how much better the winner is, so stocks of unsold goods do not reveal how strongly the different goods are desired." *Economic Calculation in the Socialist Society*, 117-118.

Thus, there is a generalized flight to real values on the part of all economic agents, who try to acquire anything, even if they do not need it immediately or at all, since they realize that scarcity is the dominant feature of the economic system and that it behooves them to acquire any type of good, even an unnecessary one, as a precaution against a future time when the good may become both useful and unavailable. This phenomenon occurs identically in the area of production. Kornai has very clearly explained that in a socialist system, industrial managers soon discover that scarcity of the different inputs, or productive factors, is the chronic, dominant feature. Furthermore, the manager realizes that he loses nothing by maintaining a very large inventory of productive factors, since the financial cost of doing so, given the absence of rigorous budget restraints, causes him no real problem. In contrast, if the manager is unable, due to the shortage of a certain material or factor of production, to achieve an objective the planning agency has coercively imposed, the manager does face a very significant, real risk. Consequently, there emerges a widespread, continuous tendency to demand and accumulate an excessive quantity of all sorts of inputs, or factors of production, including ones which are not strictly necessary, and as a result, the widespread shortage of resources inexorably becomes the defining characteristic of the socialist economic system.[33] Therefore, it is obvious that if the economic system is absolutely, chronically, and constantly riddled with shortages of most of the economic, consumer goods and productive factors in society, then a central planning agency cannot possibly find an equilibrium solution by a process of "trial and error" based on observing the *shortages* which occur in the economic system.[34]

Sixth, we must stress that the economic system is not a mere conglomeration of isolated goods and services, such that a shortage or surplus of any particular product automatically indicates the need for a price increase or decrease. On the contrary, the economic system

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[33] See the works of János Kornai, *Economics of Shortages* (Amsterdam: North Holland, 1980), and *Growth, Efficiency and Shortages* (Berkeley: University of California Press, 1982).

[34] Also, Hoff points out that under these circumstances, another insoluble problem lies in the *degree* of the price increase which the central planning agency must establish whenever a shortage occurs. According to Hoff, the fact that a shortage exists does not convey any information about how to carry out (i.e. in connection with which specific goods and to what degree) the corresponding price rise. See his *Economic Calculation in the Socialist Society*, 119.

continuously gives rise to a set of closely interrelated consumer goods and services and factors of production. Thus, for instance, the shortage of a good may not be evident even though it exists, because it is camouflaged by the presence or absence of other goods which are directly or indirectly related as complementary or substitute goods. It may also occur that a shortage appears to exist, yet because of the circumstances, it would be wiser to make better use of existing substitute goods than to raise the price. This means that the central planning agency could not be guided by the shortage or surplus of individual goods, but would have to be aware of and monitor the shortage or surplus of *all* goods *as a group*, and these goods are interrelated. Thus, a method which, like the "trial and error" method, is designed to be applied in isolation for each good or service is patently useless.[35]

Seventh, Ludwig von Mises argues that the trial and error method is only applicable as a means of addressing those problems in which the correct solution is recognizable by a series of indisputable signs and facts which are independent of the trial and error method itself. The circumstances are completely different when the only available sign of having found the correct solution consists precisely of the fact that it has been found by the method or process considered suitable for solving the problem. To put it another way, the trial and error method may be useful when a bit of knowledge exists as a point of reference against which to adjust the corresponding solution. If, as occurs in the socialist system, this point of reference does not exist because the corresponding entrepreneurial market process has been eliminated, the central planning agency will lack the guide necessary to approach the correct solution via the mechanism of trial and error. And let it not be said that such "guides" consist precisely of "objective" surpluses or shortages. Apart from the fact that, as we have already seen, these guides are neither objective nor do they indicate beyond all doubt what should be done, *such*

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[35] I owe this argument to Robert Bradley, from the economics department of the University of Houston. See "Socialism and the Trial and Error Proposal," pt. 4 of his article, "Market Socialism: A Subjectivist Evaluation," *The Journal of Libertarian Studies* 5, no. 1 (winter 1981): 28-29. Bradley concludes: "It is logically possible that a good and its substitutes all have equilibrating prices, yet their prices not be indices of the scarcity. In this case, the bad prices merely camouflage each other. So we can see that monitoring individual prices is not enough; the CPB would have to be in command of all price interrelationships. Thus the "trial and error" method becomes inadequate since it only applies to prices individually" (p. 29).

guides emerge as an endogenous result of the application of the trial and error method itself, and therefore they do not constitute an objective guide at all. They are simply the successive, arbitrary, and fortuitous manifestations of a circular process of discoordination and inefficiency, a process which leads to nothing. In an economy in which people are free to exercise entrepreneurship, in a sense it could be said that, when the different economic agents act entrepreneurially, they are following a procedure of "trial and error" to approach acceptable solutions; i.e. to discover and coordinate the maladjustments which arise in society. This is so because the interrelated entrepreneurship of the different actors generates information which could not emerge from the isolated activity of each individual, no matter how much the trial and error method is used, and this information is the essential "raw material" for estimating the profits and costs of each human action. In this way, by following the guide provided by the calculation of profits and losses, economic agents tend to act in a coordinated manner. In contrast, if one coercively prevents the free exercise of entrepreneurship, one eliminates the only process which permits the coordinated adjustment of the different individual behaviors that comprise life in society. Consequently, one eliminates the only *external guide* that enables each actor to discover whether or not he is approaching the solution which for him is most suitable.[36]

Eighth, the crucial weakness of the trial and error method is that it involves the assumption that the community will remain static, and therefore that most social circumstances will not change while the "trial" is carried out and the possible "error" exposed. Nevertheless, if we consider that (as always occurs in real life) adjustments spark off widespread changes which

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[36] According to Ludwig von Mises: "The method of trial and error is applicable in all cases in which the correct solution is recognizable as such by unmistakable marks not dependent on the method of trial and error itself … Things are quite different if the only mark of the correct solution is that it has been reached by the application of a method considered appropriate for the solution of the problem. The correct result of a multiplication of two factors is recognizable only as the result of a correct application of the process indicated by arithmetic. One may try to guess the correct result by trial and error. But here the method of trial and error is no substitute for the arithmetical process. It would be quite futile if the arithmetical process did not provide a yardstick for discriminating what is incorrect from what is correct … If one wants to call entrepreneurial action an application of the method of trial and error, one must not forget that the correct solution is easily recognizable as such; it is the emergence of a surplus of proceeds over costs. Profit tells the entrepreneur that the consumers approve of his ventures; loss, that they disapprove. The 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." *Human Action*, 704-705.

to some extent affect the prices of all productive factors and consumer goods and services, then any "correction" that is attempted as a result of real or apparent errors will always be made *too late* and will therefore be profoundly distorting. In other words, as Hayek has shown,[37] the use of the "trial and error" method is not feasible in the real word, in which changes constantly occur. Each individual change exerts almost innumerable influences on the prices, quality, and types of goods produced in society, and thus it is absolutely impossible to arrive, via the trial and error method, at a hypothetical equilibrium solution before new and subsequent changes in information render the solution totally obsolete. If the real world were unchanging and information remained constant, finding an equilibrium price system by the trial and error method might appear more feasible, if it were thought that equilibrium could constitute a somewhat clearer point of reference against which to compare the different possible, tentative solutions. However, contrary to what socialist theorists may assume, the real world is not in equilibrium, nor is it static, and hence it is impossible to find a solution to the corresponding system of equations via the trial and error method.

Ninth and last, the most powerful argument against the trial and error method is that it completely excludes entrepreneurship (see chap. 2). The essential question is *who* will apply the trial and error method. Clearly, if the decisions regarding the adoption of tentative solutions are not made by the individual economic agents who possess the practical information, then the trial and error method will lead nowhere, for reasons we highlighted in chapter 3. In addition,

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[37] In the very words of Hayek: "Almost every change of any single price would make changes of hundreds of other prices necessary and most of these other changes would by no means be proportional, but would be affected by the different degrees of elasticity of demand, by the possibility of substitution and other changes in the method of production. To imagine that all this adjustment could be brought about by successive orders by central authority when the necessity is noticed, and that then every price is fixed and changed until some degree of equilibrium is obtained is certainly an absurd idea … To base authorative price-fixing on the observation of a small section of the economic system is a task which cannot be rationally executed under any circumstances." "The Present State of the Debate," *Collectivist Economic Planning*, 214. Five years later, in 1940, in a response to Lange, Hayek would even more clearly assert: "It is difficult to suppress the suspicion that this particular proposal (the trial and error method) has been born out of an excessive preoccupation with problems of the pure theory of stationary equilibrium. If in the real world we have 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 state of equilibrium could indeed be approached by the method of trial and error. *But this is far from*

the central planning agency will lack the vital practical information which is only created and available in the minds of the people who act by exercising entrepreneurship. Moreover, the information necessary to coordinate and adjust society will not even be created if everyone is not free to exercise entrepreneurship. And if this information is not even generated, it can hardly be transmitted to a central planning agency. As we have mentioned, if the trial and error method is to make any sense, it must be applied on an individual level within the context of a market economy in which people are completely free to exercise entrepreneurship and can, without hindrance, take possession of the fruits of their own entrepreneurial creativity. Furthermore, let us recall that information is strictly subjective, and different actors will interpret the same observable real-world events in different ways and thus generate different information regarding them, according to each actor's particular circumstances and the context in which he acts. When faced with a certain shortage, it cannot be at all reassuring in economic terms for the central planning agency to automatically apply a pre-established rule (to produce more of the good X, or to raise its price by a certain percentage), because if the entrepreneurial process were left free, human creativity would certainly find radically different solutions to the same objective problem. Hence, when faced with a shortage, rather than raising the price, it might be more appropriate to devote entrepreneurial ingenuity to finding new solutions to the problem by developing substitute goods, searching for new alternatives no one has yet discovered, etc. Thus, we see that it is logically impossible to use the trial and error method to effectively adjust the solution of a hypothetical system of equations capable of making economic calculation possible in a society in which the free exercise of entrepreneurship is prohibited. Under these conditions, the central planning agency will lack the vital practical information, which the economic agents who participate in the system will not even create, and as a result, there will be no guide by which to coordinate the continual maladjustments which can arise in society. Therefore, the centralized use of the trial and error method does not lead to

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being the situation of the real world, where constant change is the rule." "Socialist Calculation III: The Competitive Solution," in *Individualism and Economic Order*, 188.

any equilibrium solution, nor is it capable of directing the hypothetical central coercion agency toward the decisions and measures which will allow it to coordinate the social process.[38]

THE THEORETICAL IMPOSSIBILITY OF PLANOMETRICS[39]

The above critical observations about the use of the "trial and error" method to solve the problem of socialist economic calculation are fully applicable to the vast literature[40] which, following the debate and more recently, has flowed from the pens of economists of the general equilibrium school, under the generic heading of "planometrics." This line of research depends upon a varied set of highly sophisticated mathematical techniques, including linear and non-linear programming, whole-number programming, a very large part of the cybernetic theory of decision, and also a number of computer procedures involving an iterative approach. The

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[38] See also, in the next chapter, the criticism of the "trial and error" method Oskar Lange proposed.

[39] J. Wilczynski has popularized this word and states: "Planometrics is a branch of economics concerned with the methodology of constructing economic plans especially arising at the optimal plan, with the aid of modern mathematical methods and electronic computers." *The Economics of Socialism*, 3rd ed. (London: George Allen & Unwin, 1978), 17, 24, 46. Other terms which have at times been used to refer to this branch of economics are "computopia," and "the theory of mechanisms for resource allocation," names we owe to Egon Neuberger ("Libermanism, Computopia and Visible Hand: The Question of Informational Efficiency," *American Economic Review*, "Papers and Proceedings" [May 1966]) and Leonid Hurwicz ("The Design of Mechanisms for Resource Allocation," *American Economic Review*, no. 63 [May 1973]), respectively.

[40] As for "planometrics" literature, see, for example, the following works: K.J. Arrow and L. Hurwicz, *Studies in Resource Allocation Processes* (Cambridge: Cambridge University Press, 1977); Leonid Hurwicz, "The Design of Mechanisms for Resource Allocation," *American Economic Review* 2, no. 63 (May 1973); John P. Hardt and others, eds., *Mathematics and Computers in Soviet Economic Planning* (New Haven, Connecticut: Yale University Press, 1967); and Benjamin N. Ward, "Linear Programming and Soviet Planning," in *Mathematics and Computers in Soviet Economic Planning*, and *The Socialist Economy: A Study of Organizational Alternatives* (New York: Random House, 1967). On p. 94 of Don Lavoie's brilliant book, *Rivalry and Central Planning*, we find an exhaustive summary of all the existing English-language works on the topic. In German, we must not forget the overview of planometrics literature which Christian Seidl provides in his article, "Allokations Mechanismus Asymmetrische Information und Wirtschaftssystem," in *Jahrbücher für Nationalökonomie und Statistik* 3, no. 197 (1982): 193-220. A brief but valuable review of the contributions made until now [1992] in this field and of the main problems associated with them appears in John Bennett's book, *The Economic Theory of Central Planning* (London: Basil Blackwell, 1989), esp. chap. 2, pp. 9-37. Also of interest is Peter Bernholz's paper, "Information, Motivation and the Problem of Rational Economic Calculation in Socialism," chap. 7 of *Socialism: Institutional, Philosophical and Economic Issues*, ed. Svetozar Pejovich (Dordrecht, Holland: Kluwer Academic Publishers, 1987), 161-167. Finally, we should mention the Soviet school established under the auspices of Leonid V. Kantorovich, who was obsessively concerned with the development and perfecting of optimization techniques and was never able to grasp the economic (rather than "technical") problem socialism poses, nor, thus, to provide any solution to the gradual breakdown of the Soviet model. See Roy Gardner, "L.V. Kantorovich: The Price Implications of Optimal Planning," *Journal of Economic Literature* 28 (June 1990): 638-648, and all references cited there.

fundamental objective of these models is to determine *a priori* an entire configuration of equilibrium prices. In other words, ahead of what the market would spontaneously establish, an attempt is made to find a solution which would *precoordinate* all of the plans of economic agents and would therefore render unnecessary the market's real coordination process, which by its very nature, always operates *a posteriori*, since the force of entrepreneurship sets it in motion. In short, the purpose of planometric techniques is none other than to replace the competitive entrepreneurial process with a mechanism that would make it possible to centrally precoordinate society.

It is true that up to this point, it has been impossible to put any of the planometric models into effect, and that even socialist theorists admit it to be highly unlikely they will be implemented. Nevertheless, some people still argue today that this situation chiefly results from limitations to computer capacity, as well as from the shortage of sufficiently qualified personnel and from technical difficulties in obtaining the necessary information. However, as the years have gone by, the notion that the market could be replaced with an all-inclusive system of computerized planning, to be applied via planometric models, has been gradually abandoned by even the very authors who carry out this program of scientific research. Furthermore, the failure which followed the introduction of planometric techniques in the countries of Eastern Europe during the 1970s gave rise not only to the abandonment of new practical attempts of this sort, but also to a profound sense of disappointment among all those who had naively pinned their hopes on these techniques.[41] Despite all of the above, two important factors remain which now

[41] On the disappointment related to the application of planometric models, Michael Ellman states: "Work on the introduction of management information and control systems in the soviet economy was widespread in the 1970's, but by the 1980's there was widespread scepticism in the USSR about their usefulness. This largely resulted from the failure to fulfill the earlier exaggerated hopes about the returns to be obtained from their introduction in the economy." See the article by Michael Ellman, "Economic Calculation in Socialist Economies," in *The New Palgrave: A Dictionary of Economics* (London: Macmillan, 1987), 2:31. Jan S. Prybyla makes a similar assertion in his *Market and Plan Under Socialism* (Stanford: Hoover Institution Press, 1987), 55. For his part, Martin Cave, in his *Computers and Economic Planning: The Soviet Experience* (Cambridge: Cambridge University Press, 1980), after pointing out the profound disparity and separation between two groups of researchers, those who devote their efforts to formulating abstract planometric models, and others who concentrate on studying real systems, he concludes that the increasing scepticism surrounding planometric models as possible substitutes for the market derives from the fact that "they do not, nor are they intended to, do justice to the complexities of a centrally-planned economy" (p. 38). Even Hurwicz appears to have resigned himself to

justify a separate study of planometrics, precisely after having examined, in the last section, the theoretical infeasibility of the "trial and error" method.

First, let us note that various writers in this field continue to naively affirm that even though there have been only failures and frustrations up to now, it may be possible that in the future, successive refinements of the theory, together with foreseeable improvements in computer capacity, will permit what thus far has been impossible. Hence, for example, Musgrave, in a study in which he evaluates the result of the economic calculation debate, concludes that planning, as an efficient system, could be implemented by allowing planners to simulate the competitive market and by applying the corresponding computer techniques. Arrow, for his part, states that due to the development of mathematical programming and of high-speed computers, a system of central planning no longer appears an impossible future goal, since the functioning of a decentralized system can be simulated by simply choosing the corresponding centralized algorithm.[42] According to these and other authors, improvements in

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the view that planometrics is useful only as a purely intellectual exercise, which would correspond to an initial theoretical step (that of "formulating" the problem) toward solving the problem of economic calculation. This step would later have to be brought into effect by letting in market forces and adjusting the plan to the realities of the market, rather than the opposite; that is, adapting the market to the parameters of the planometric model. See his "Centralization and Decentralization in Economic Processes," in *Comparison of Economic Systems: Theoretical and Methodological Approaches*, ed. Alexander Extain (Berkeley: University of California Press, 1971), 81.

[42] The error these two authors commit lies in their ignorance of the fundamental functioning of market processes, which we explained in chapter 2. Arrow has gone so far as to assert: "Indeed, with the development of mathematical programming and high speed computers the centralized alternative no longer appears preposterous. After all, it would appear that one could mimic the workings of a decentralized system by an appropriately chosen centralized algorithm." Kenneth J. Arrow, "Limited Knowledge and Economic Analysis," *American Economic Review* 64 (March 1974): 5. It seems almost inevitable that even the most brilliant minds, like Arrow, lose the ability to perceive fundamental economic problems when they become obsessed with mathematical equilibrium analysis. In fact, Musgrave makes the very same mistake in his article, "National Economic Planning: The U.S. Case," *American Economic Review*, no. 67 (February 1977): 50-54. Another writer who commits an error similar to that of Arrow and Musgrave is Wilczynski, even if it is more understandable in his case, considering his commitment to socialist ideology. Wilczynski actually states: "The feasibility of the computational optimal prices conclusively refutes any grounds for the claim that rational pricing was impossible under socialism. Even though much remains to be done on the practical level, there is a sound theoretical basis. In fact, in some respects, socialism provides the possibility of improving on capitalism." See *The Economics of Socialism*, 138. Another author who has, from the general equilibrium theory, arrived at the conclusion that the essential principles for organizing a centrally-planned economy can be easily drawn from the Walrasian model is the French economist Maurice Allais. Allais, who combines the natural mental confusion which results from the use of the mathematical method in economics with a very distinctive idiosyncrasy, has gone so far as to assert that in an equilibrium economy with perfect competition, interest on capital would disappear. (This is clearly an absurd idea, because even under such circumstances, it would be necessary to deal with the applicable capital depreciation rates, and the subjective forces of time preference would continue to exert their

linear programming and computer technology would make it possible to solve the problem of socialist economic calculation as Mises and Hayek presented it.

Second, other planometrics theorists, led by Hurwicz, claim not only to have refuted Hayek's computational argument (which, as we know, was merely of secondary importance to him), but also to have incorporated into their planometric models the fundamental argument concerning the dispersed nature of information.[43] Thus, Hurwicz begins by assuming that each

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influence.) Allais proposes that land be nationalized and that "prices" be expressed in terms of a unit of account based on a unit of "specialized labor" time. See Maurice Allais, "Le problème de la planification dans une économie collectiviste," *Kylos* (July – October 1947), vol. 1: 254-280, vol. 2: 48-71. With respect to these absurd proposals made by Maurice Allais, Karl Pribram makes the following comment in his monumental work, *A History of Economic Reasoning* ([Baltimore: Johns Hopkins University Press, 1983], 459): "It has been one of the strange episodes in the history of economic reasoning that radical minds, bent on overthrowing the existing economic order, nevertheless believed – or pretended to believe – that, contrary to any historical experience, the pattern for the organization of a 'planned' economy could be supplied by a model of the Walrasian type in which full reliance was placed on the automatic working of equilibrating forces." Finally, two well-known economists from Eastern Europe, Wlodzimierz Brus and Kazimierz Lasky, make the same point in a recent work in which, as we will see in detail later, they unambiguously show that Mises and Hayek were in the right in the socialist economic calculation debate, and that in no way did Oskar Lange nor anyone else answer them satisfactorily. Brus and Laski blame the neoclassical model in general, and the Walrasian model in particular, because they fail to take account of the essential figure in the capitalist system: the entrepreneur. They also criticize the fact that the model of "perfect competition" does not allow for any of the typical struggle and rivalry that exists between entrepreneurs, a rivalry which results in the constant creation of new information. The authors conclude: "The Walrasian model overlooks the true central figure of the capitalist system, namely the *entrepreneur* sensu stricto. Formally there are entrepreneurs in the Walrasian model, but they behave like *robots*, minimizing costs or maximizing profits with the *data given*. Their behavior is that of pure optimizers operating in the framework of exclusively passive competition, reduced to *reactive* adjustment of positions to an exogenous change. This can scarcely be a legitimate generalization of competition, which in *reality* is a constant struggle affecting the data themselves. It is here that the static approach of the general equilibrium theory becomes particularly pronounced, contrary to the actual *dynamics* of a capitalist system." See their work, *From Marx to the Market: Socialism in Search of an Economic System* (Oxford: Clarendon Press, 1989), 57. On the same topic, see our article, "La Crisis del Paradigma Walrasiano," *El País*, 17 December 1990, p. 36.

[43] See Leonid Hurwicz, "The Design of Mechanisms for Resource Allocation," 5. Hurwicz has boasted of incorporating the contributions of Hayek and Mises into his models: "The ideas of Hayek (whose classes at the London School of Economics I attended during the academic year 1938-39) have played a major role in influencing my thinking and have been so acknowledged. But my ideas have also been influenced by Oskar Lange (University of Chicago 1940-42) as well as by Ludwig von Mises in whose Geneva Seminar I took part during 1938-1939." See Leonid Hurwicz, "Economic Planning and the Knowledge Problem: A Comment," *The Cato Journal* 4, no. 2 (fall 1984): 419. With the above statement, Hurwicz simply reveals that, as Don Lavoie has shown so well, Hurwicz completely failed to grasp the messages of both Hayek and Mises, despite having attended, as he himself affirms, their respective classes and seminars. In fact, not only do Hurwicz's writings totally lack a theory of entrepreneurship, but he also constantly assumes that information is *objective* and although dispersed, that it can be transmitted with the same meaning to everyone. Thus, he overlooks the essential characteristics of entrepreneurial information, which lies at the heart of market processes; basically, he neglects to consider its subjective and inarticulable nature. See Don Lavoie's interesting work, *The Market as a Procedure for Discovery and Conveyance of Inarticulate Knowledge*, working paper, Department of Economics, George Mason University, November 1982. Furthermore, as Hurwicz makes clear in his response to Kirzner in the article published in the *Cato Journal* (and cited above), Hurwicz views the problem of dispersed knowledge as merely an issue of transmitting existing information, and he fails to

economic agent initially possesses only information which is available exclusively to him (consumers about their own preferences, producers about the technologies they could employ, etc.). Hence, in his planometric models, the corresponding production functions are never considered known to the central planning bureau, but instead, only to the individual economic agents. In fact, in many models, it is supposed that not even the producers know all of their production functions, but only those with which they have had some experience. Given the nature of prices as efficient transmitters of information, the only knowledge which, according to these models, is to be transmitted between the central planning bureau and economic agents is a mere list of "prices" for *all* goods and services in the economy, a list which the central planning bureau is to publish in response to another, one which would reflect the quantities of each good and service produced by each economic agent. The transmission of this immense amount of information from the central planning agency to economic agents (prices) and from economic agents to the central planning agency (quantities produced) would not present any special problem, according to planometrics theorists, particularly if we take into account the latest advances in the field of telecomputing. Finally, different computer iteration procedures would make it possible to modify prices as surpluses and shortages arose, and this method would eventually give rise to that system of equilibrium equations which would offer a solution to the economic problem posed. Thus, a sort of "computer dialogue" would take place between the central authority, which would tentatively establish prices, and economic agents, who would receive instructions to produce the largest quantities they could while keeping prices equal to the corresponding marginal costs (that is, making marginal revenue equal marginal costs). These quantities would be communicated to the central authority, which would review, modify,

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even consider the problem the *creation of new information* poses, and this is the most important problem in a market process and is the central element in Kirzner's entire theory of entrepreneurship. The distinguished Frank Hahn makes the same errors as Hurwicz, and as recently as 1988, he dared to confidently assert that sooner or later, the "market socialism" Lange and Lerner developed would provide an alternative far superior to the market economy of the capitalist system. See his "On Market Economics," in Robert Skidelsky, ed., *Thatcherism* (Chatto & Windus, 1988), esp. p. 114. An excellent, detailed critique of Frank Hahn's position appears in Arthur Seldon's, *Capitalism* (Oxford: Basil Blackwell, 1990), chap. 6, 124-144.

and retransmit the prices to the economic agents, and so forth, until the surpluses and shortages disappeared.

The planometric proposal we have just described does not differ greatly in fundamental content from those Oskar Lange made in the 1930s, proposals we will very closely analyze in the following chapter. Despite the "ingeniousness" of the above planometric strategy, we will now show that planometric models have not actually, in any way, come to incorporate Hayek's contribution regarding the problem of the dispersed quality of knowledge, and that therefore they are useless for providing a solution to the problem of socialist economic calculation. Furthermore, we will digress a bit to consider the possible role of computers and computer science in this matter, and we will confirm what we demonstrated in chapter 2, to the effect that developments in computer science, far from providing the solution to the problem of socialist economic calculation, in reality make it much more complex and difficult.

Even though our specific criticism of the mathematical "trial and error" method (in the last section) applies to the whole of modern planometrics theory, it is also necessary to respond to the two particular factors we have just highlighted. Many planometrics specialists believe that the problem has theoretically been resolved, that the dispersed nature of information has even been taken into account, and that now we must only wait for the necessary advances in computer capacity in order to put the corresponding models into effect. On the contrary, as we will see, planometric models have not taken account of certain essential characteristics of the real world, qualities which Austrian economists had already described and which render the functioning of these models theoretically impossible, completely regardless of the future development of computer capacity, in terms of both hardware and software.

First, planometric models in general, and Hurwicz's theory in particular, have only come to incorporate the principle of the dispersed nature of information in an *awkward and adulterated* form. This is so because the fact that information is dispersed in the minds of all the individual economic agents *is essentially inseparable from the subjective and strictly personal quality of information*, as we saw in detail in chapter 2 of this book. If information is not only dispersed, but also personal and subjective, it will convey a very different meaning to

each economic agent, and therefore, it will be impossible to transmit it, with one sole meaning, to any planning center. In other words, the same price, the same external material object, the same quantity, and the same experiences will have a very different meaning or interpretation for one person than for another. The same can be said for the different options viewed as possible for carrying out a certain project, achieving a certain end, or producing a certain good or service. Also, a product surplus or shortage will communicate a very different meaning, depending upon the actor who observes it, and, according to the circumstances, it may prompt very different behaviors (an attempt to reduce demand, the creation of substitute goods, the search for new horizons, or any combination of these behaviors, etc.). Thus, the subjective nature of information invalidates Hurwicz's entire model, which is based on a constant dialogue or transmission of information that is erroneously considered objective; this exchange takes place between agents (possessors of a hypothetically dispersed, yet objective, knowledge) and the central planning bureau.

Second, and intimately related to the above argument, is the fact, which we also discussed in detail in chapter 2, that the knowledge that is vital to human action is mostly of a *tacit*, or inarticulable, nature. If most of the knowledge man uses when acting cannot be formally articulated, it can hardly be transmitted in an objective manner to anyone. It is not just that economic agents interpret the same prices or historical terms of trade in very different ways; it is also that these prices convey information to certain actors because, to a greater or lesser extent, these actors share a certain store of practical, inarticulable knowledge about the characteristics of the goods and services which were exchanged and gave rise to those prices, as well as about a thousand other circumstances they subjectively consider relevant in the context of the actions in which they are involved. For example, the articulate or formalized part of the message an actor interprets when he realizes that a pound of potatoes sells for 30 monetary units (the articulate portion would be "the price of a pound of potatoes is 30 m.u.") represents a minimal part of the total amount of information the actor knows, generates, and uses in the context of his specific action (information regarding his desire to buy potatoes, the different levels of quality available in potatoes, the quality of the potatoes his supplier normally provides,

the actor's excitement about cooking with potatoes, the dish he plans to prepare for his guests, the other foods he plans to prepare to accompany the potatoes, and a thousand other details).[44]

Third, from a more dynamic perspective, a price or set of prices conveys a certain meaning to an actor only because he finds himself immersed in a certain project or action; that is, he has committed himself to achieving certain ends or ideals, which he alone can truly imagine and pursue in all of their richness and complexity. An actor believes in a certain project, and imagines it and eagerly pursues it based on subjective expectations and feelings which are basically inarticulable and therefore cannot be transmitted to any planning center. The entrepreneur who believes in an idea and pursues it against all odds, and often in spite of the most adverse conditions and against the opinion of the majority, in the end may reach his goal and obtain the corresponding profits. The end he aspires to, the profit he intends to generate, or the truth he seeks is not something given which can be seen with perfect clarity, but rather something he intuits, imagines, or creates. And it is precisely this *creative tension* which makes it possible to discover and create the information that sustains society and leads to its advancement. Creative tension arises from the variety present in the market; or rather, from the different opinions or interpretations that spring from the same facts, events, and circumstances, which, nevertheless, are interpreted differently by different economic agents. Planometrics theorists overlook or explicitly eliminate this creative tension from their models, which, as they are intended to achieve an *a priori* coordination of the entire economic system, totally exclude the possibility of actors' responding creatively to the incentive discoordination provides.[45] It

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[44] "The articulate information supplied by prices is only informative because they are juxtaposed against the wide background of inarticulate knowledge gleaned from a vast experience of habitual productive activity. A price is not just a number. It is an indicator of the relative scarcity of some particular good or service of whose *unspecified qualities and attributes we are only subsidiarily aware*. Yet were these qualities of a good to change in the slightest respect this could change incremental decisions about the uses of the good just as a significantly as a change in price … Hayek was not contending that prices as numbers are the only pieces of information that the market transmits. *On the contrary, it is only because of the underlying inarticulate meaning attached to the priced goods and services that prices themselves communicate any knowledge at all.*" Don Lavoie, *The Market as a Procedure for Discovery and Conveyance of Inarticulate Knowledge*, 32-33.

[45] Don Lavoie, in the paper we have been discussing, draws, following Polanyi, a noteworthy analogy between the role of inarticulable knowledge in the area of scientific research and in the area of the market. He concludes: "Market participants are not and could not be 'price takers' any more than scientists could be 'theory takers.' In both cases a background of unquestioned prices or theories are

therefore becomes an inevitable conclusion that the dialogue or transmission of dispersed information between economic agents and the central planning agency, as Hurwicz proposes it, is theoretically impossible. This is due to two factors: first, economic agents, to a great extent, lack the knowledge which would have to be transmitted,[46] since such knowledge arises only from a process in which actors can freely exercise their entrepreneurship, and second, they could not transmit the knowledge they do possess either, because it is mostly of a tacit, inarticulable nature. The entrepreneur's knowledge is inarticulate, since it is more of a "thought technique" which can only be applied if the actor is in a context typical of a market economy, and the actor can only learn this technique intuitively, by putting it to practical use. That minds of the caliber of Arrow and Hurwicz have failed to recognize the essential characteristics of the type of knowledge economic agents use and generate, and thus, that these minds are ignorant of

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subsidiarily relied upon by the entrepreneur or scientist, but also in both cases the focus of the activity is on *disagreeing* with certain market prices or scientific theories. Entrepreneurs (or scientists) actively disagree with existing prices (or theories) and commit themselves to their own projects (or ideas) by bidding prices up or down (or by criticizing existing theories). It is only through the intricate pressures being exerted by this rivalrous struggle of competition (or criticism) that new workable productive (or acceptable scientific) discoveries are made or that unworkable (or unacceptable) ones are discarded … Without the "*pressure*" that such personal commitments impart to science and to the market, each would lose its 'determining rationality.' It is precisely because the scientist has his reputation – and the capitalist his wealth – *at stake* that impels him to make his commitments for or against any particular direction of scientific or productive activity. Thus private property and the personal freedom of the scientist play analogous roles. When either form of personal commitment is undermined, for example when scientific reputation or economic wealth depend on loyalty to a party line rather than to a personal devotion to truth or a pursuit of subjectively perceived profit opportunities, each of these great achievements of mankind, science and our advanced economy, is sabotaged." Don Lavoie, *The Market as a Procedure for Discovery and Conveyance of Inarticulate Knowledge*, 34 and 35. Polanyi draws the same analogy between the market and the advancement of science in "The Republic of Science: Its Political and Economic Theory," in *Knowing and Being*, ed. Marjorie Grene (Chicago: The University of Chicago Press, 1969).

[46] Fritz Machlup, *Knowledge: Its Creation, Distribution and Economic Significance*, vol. 3, *The Economics of Information and Human Capital*, chap. 6, "New Knowledge, Disperse Information and Central Planning." See especially p. 200, where Machlup refers to the fact that "the knowledge of people's preferences is not only dispersed over millions of minds and not only subject to continual change but that it has too many blank spaces to be transferred in the form of price-or-quantity responses. The described planning system cannot give the people what they want, because they themselves cannot know what they want if they do not know what they could have. A steady stream of innovations in a free-enterprise system keeps altering the 'production possibilities,' including those that relate to new products and new qualities of existing products. Imaginative entrepreneurs, stimulated by anticipations of (temporary) profits, present consumers with options that have not existed hitherto but are expected to arouse responses of a kind different from those symbolized in the customary model of market equilibrium and in models of allocative equilibrium. The availability of new products makes a market system quite unlike the scheme of official indicators of quantities or prices announced by a central board and private proposals of prices or quantities submitted in response by the consuming public. *The organized feedback shuttle allowing informed decisions by a planning board does not give a place to the phenomenon of innovation*."

the most fundamental principles of the functioning of the market, justifies the remark Hayek made in 1982, when he had no choice but to call both of these authors "irresponsible," particularly for believing that practical, subjective, and inarticulable knowledge can be transmitted in the form of a "computer dialogue" between economic agents and the central planning bureau, an idea Hayek severely termed "the crowning foolery of the whole farce" that is planometrics literature.[47]

Fourth, we must bear in mind that planometric price-adjustment models require that, once the information has been transmitted to the central planning agency, all trade or production activities be suspended while this agency resolves the corresponding optimization problem and sends economic agents the new information about equilibrium prices. Some economists, like Benjamin Ward, even arrive at the absurd conclusion that such a system is much more efficient than that of a real market economy, in which exchanges are constantly taking place at prices which do not correspond with equilibrium prices, and therefore can be considered "false." That *real* market prices are labeled "false" because they do not coincide with some unknown, hypothetical "prices" which exist solely in the clouded minds of equilibrium theorists is surprising at the very least. It is absurd to view as false something which exists and has actually come about as a result of free human action, but it is even more absurd when we consider that no true equilibrium "price" can ever be known. Furthermore, the great advantage of the market process over the planometric adjustment model lies precisely in this real-life possibility of carrying out supposedly "false" exchanges. In fact, in the planometric model, while all action and exchange stand still and information is transmitted to the planning agency and it resolves

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[47] "It was probably the influence of Schumpeter's teaching more than the direct influence of Oskar Lange that has given rise to the growth of an extensive literature of mathematical studies of 'resource allocation processes' (most recently summarised in K.J. Arrow and L. Hurwicz, *Studies in Resource Allocation Processes*, Cambridge University Press, 1977). As far as I can see they deal as irresponsibly with sets of fictitious 'data' which are in no way connected with what the acting individual can learn as any of Lange's." See "Two Pages of Fiction: The Impossibility of Socialist Calculation," originally published in *Economic Affairs* (April 1982) and reprinted in *The Essence of Hayek*, ed. Chiaki Nishiyama and Kurtz R. Leube (Stanford, California: Hoover Institution Press, Stanford University, 1984), 60. On p. 61 of this same work, Hayek adds that "the suggestion that the planning authority could enable the managers of particular plants to make use of their specific knowledge by fixing uniform prices for certain classes of goods that will then have to remain in force until the planning authority learns

the corresponding system of equations, millions of economic agents are prevented from discovering and creating new information, and many human actions are thwarted, all to the detriment of society's process of adjustment, coordination, and development. In contrast, in the real market process entrepreneurship drives, even though equilibrium is never reached (and thus, all real-life exchanges are, in this sense, "false"), new information is constantly generated, and all maladjustments or disparities tend to be revealed by the force of entrepreneurial alertness and then suitably coordinated and adjusted. The main advantage of real market processes, as opposed to the planometric models of the "Walrasian auctioneer," is that in real processes, even though exchanges are constantly taking place, and no exchange occurs at an equilibrium price (and thus the actual prices are, in this sense, "false"), these processes work well in both theory and practice, since any maladjustment or disparity creates the incentive necessary, and the resultant tendency, for it to be discovered and eliminated through the innate force of entrepreneurship. In this way, a huge amount of vital information is created and continually transmitted to society in general. In contrast, in order to function, planometric models not only require that human action and the creation of new information be frozen for a certain period, but they also totally eliminate the creative exercise of entrepreneurship, which is the key to social coordination.[48]

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whether at these prices inventories generally increase or decrease is just the *crowning foolery of the whole farce*."

[48] Benjamin N. Ward, *The Socialist Economy: A Study of Organizational Alternatives* (New York: Random House, 1967), 32-33. In this work, Ward also makes some passing remarks about the simplifications in these mathematical models (basically their static, linear nature), but he assumes that a bottleneck would never form in the communication between the different sectors and the planning agency because it "involves at each round sets of numbers that should not exceed n^2 for any one unit, where *n* is the number of sectors, and is generally much less" (p. 61). Nevertheless, he adds that, in any case, if the time period necessary to complete the iteration were too long, the process could stop at a partial iteration, before it reached completion, and the result would be a plan which, although not optimum, would in practice be at least an "improvement." As Don Lavoie has clearly indicated, it seems incredible that Ward has not realized that with this proposal, he abandons the most important raison d'être of the Walrasian tatonnement process. If economic agents must stop all activity while linear-programming experts calculate the equilibrium solution to adopt later, and this solution is only an approximate and intermediate one, then why, after all, should the planometric process be initiated, if decentralized market mechanisms and the corresponding legal system constantly offer a more accurate result, without the necessity of ever halting action, nor of thwarting the creation of new information, and without the additional cost entailed by the involvement of planometric theorists? See Don Lavoie, *Rivalry and Central Planning*, 99. Edmond Malinvaud commits a very similar error when, beginning with the study of the process of determining the optimum production level of public goods, he focuses on the analysis of the iterative processes of approaching the optimum equilibrium solution in a socialist system. See his "A

Fifth, the chief underlying weakness of all planometric models is found in their extreme minimization and trivialization of the problem posed by the constant market changes which occur in a complex modern economy. In the real world, a modern society cannot allow itself the luxury of waiting for the "solution" to a programming problem with implications for the activity and lives of all its members. Furthermore, such a solution is theoretically impossible, since the problem cannot even be considered without dictatorially freezing or forcing reality, given the impossibility of transmitting and generating the necessary information. To illustrate the above, Michael Ellman states that it took six years just to compile the information necessary to formulate a linear-programming problem commissioned in the 60s by the planning department for metal industries in the former Soviet Union, and that the problem was formulated using over 1,000,000 unknowns and 30,000 restrictions.[49] As is logical, the "solution" to this problem was purely imaginary, since the relevant information changed radically (or certainly would have) within this six-year period. Thus, by the time the problem was "resolved," it had changed completely, and hence the "solution" found was totally obsolete. Because planometrics specialists lack the necessary information, it is clear that in a dynamic, real world, they would be forced to blindly and perpetually seek a nonexistent equilibrium "solution" which they could never hit upon, since it would be in a process of continual change. Therefore, we can conclude with Peter Bernholz that under the real conditions of a variable economy, rational economic calculation is impossible if a planometric system of central planning is used.[50]

Planning Approach to the Public Good Problem," *The Swedish Journal of Economics* 73 (March 1971): 96-112; and also his "Decentralized Procedures for Planning," in *Activity Analysis in the Theory of Growth and Planning*, ed. E. Malinvaud and M. Bacharach (London: Macmillan, 1967). Frankly, it is very difficult to comprehend the tremendous obsession of all these authors with replacing the infinite variety and richness of human social life with a totally rigid, cold, and mechanical model.

[49] Michael Ellman, "Economic Calculation in Socialist Economies," in *The New Palgrave: A Dictionary of Economics*, 2:31.

[50] "With different and changing production functions, the size of firms and the structure of industry become a problem. New goods and changing preferences also pose the problem of which firms or industries to expand, to contract, to abolish, or to create … Under these conditions the Central Planning Board will not be able to get the information necessary for reliable *ex ante* planning because of the nature and complexity of the situation. *Rational calculation does break down if central planning is used*." Peter Bernholz, "The Problem of Complexity under non Stationary Conditions," in "Information, Motivation

Sixth, planometrics theorists not only show a profound ignorance of the way in which real market processes operate, but they also lack an understanding of the fundamental elements of the theory of computer systems. Let us recall that the type of "information" which can be stored on a computer is totally different from that which economic agents consciously use in the market. The former is objective, articulate "information," and the latter is subjective, tacit, practical information. As is logical, the latter, which is the vital sort for economic problems, cannot be stored nor handled using a computer. Furthermore, it is obvious that information which has not yet been generated by the economic system cannot be transmitted nor handled using computer procedures either. In other words, both inarticulable, practical information and a large share of the articulate information result from a social market process, and until this process has generated the information, it cannot be transmitted nor stored in any computer data-storage system. Also, and perhaps this is the most important point, if we begin by considering that even the most complex computers of each generation may be used in a decentralized manner by the economic agents themselves (different actors, entrepreneurs, agencies, and institutions), it is clear that on a decentralized, individual level, these powerful machines will create a context in which it will be possible to generate practical, inarticulable knowledge which is infinitely more varied, complex, and rich, and the complexity of this information will render it impossible to handle in a centralized way using computers. In other words, a computer system could possibly handle and account for control systems simpler than itself, but what it will not be able to do is account for or solve systems or processes which are more complex than itself, systems in which the computer capacity of each element is qualitatively equal in complexity to that of the central planning bureau. Lastly, it is obvious that no computer can, nor will ever be able to, perform typically human, entrepreneurial activities. That is, a computer will never be capable of realizing that a certain bit of objective information has been incorrectly interpreted and that, therefore, unexploited profit opportunities remain. A computer will not be able to conceive new projects no one has yet imagined. A computer will not be able to create

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and the Problem of Rational Economic Calculation in Socialism," in *Socialism: Institutional,*

new ends and means, nor to pursue against the tide activities which are not in fashion, nor to courageously struggle to make a success of a company no one believes in, etc. At most, a computer can be a powerful, useful tool for handling articulate "information" in order to facilitate human entrepreneurial activity as we described it in chapter 2, but computers will never eliminate nor replace this entrepreneurial activity.[51] In fact, not only does computer science offer no help in replacing the complex processes of spontaneous coordination which operate in the economy, but on the contrary, it will in any case be the economic theory of market processes which will be able to assist in developing a more advanced theory of computer science. Indeed, recent developments in computer science theory concerning expert systems and the utopian concept of "artificial intelligence" have revealed that only a profound analysis of the mechanisms by which information is created and transmitted in the market has led to significant advancement in these areas.[52]

Finally, we do not wish to conclude our comments on planometrics without again stressing that the use of the mathematical method in economics can cause great confusion and harm if the scholars who use it are not extremely careful. To be specific, the mathematical method is only suitable for describing equilibrium systems, or at most, crude, repetitive, and mechanical caricatures of the real processes of change and creativity that operate in the market. Furthermore, the mathematical method does not permit the formal expression of the essence of

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Philosophical and Economic Issues, ed. Svetozar Pejovich, 154.

[51] Assar Lindbeck, in *The Political Economy of the New Left* (New York: Harper & Row, 1971), states: "It is obvious that computers cannot take over from markets the task of generating information (about consumer preferences and productive technology) nor that of *creating* incentives to promote efficient functioning according to the preferences of consumers." Thus, he concludes: "The chances of *substituting* computers for decentralized market competition, in order to manipulate information and calculate approximations of the optimal allocation, are very limited." In light of the arguments given in the main text, I would say they are nil. [The above excerpts have been translated from the Spanish edition, *La Economía Política de la Nueva Izquierda* (Madrid: Alianza Editorial, 1971).]

[52] See especially the article by Don Lavoie, Howard Baetjer, and William Tulloh, "High-Tech Hayekians: Some Possible Research Topics in the Economics of Computation," *Market Process* (George Mason University) 8 (spring 1990): 120-146, as well as the bibliography these authors cite. We will not busy ourselves with listing and examining other inadequacies of the planometric models from the standpoint of the methodology used in equilibrium and welfare economics itself. The corresponding criticisms are not only irrelevant in comparison with the fundamental arguments presented in the text, but they can also be found in any standard manual on the topic, for example, John Bennet's *The Economic Theory of Central Planning*, chap. 2. Also of interest is D.F. Bergun's paper, "Economic Planning and the Science of Economics," *American Economic Review* (June 1941).

entrepreneurship, which is the basic, key element in all of economic and social life. The mathematical economist constantly runs the risk of believing that prices and costs are determined by intersecting curves and functions, and not by a sequence of very concrete human actions and interactions. He may come to believe the functions he works with are real and can be known. In short, he may get the idea that the information he assumes is given in order to construct his models does actually exist in objective form somewhere in the market, and thus could be compiled. In light of the effects the mathematical method has generally had in the different spheres of economics, particularly in the case of the proposals for socialist economic calculation which we have studied, one wonders if this method has not done significantly more harm than good in the development of our science.[53] The argument Mises and Hayek advanced in favor of a market economy and against socialism differs totally from the reasoning mathematical "welfare" economists use to justify "private enterprise;" the latter base their reasoning on "perfect competition" as an expression of the Paretian ideal of efficiency. In this book, we offer the basic argument not that competition provides an "optimum" combination of resources, but that it is a dynamic process driven by flesh-and-blood people, a process which tends to adjust and coordinate society. The essential argument is not that a system of "perfect competition" is better than a monopoly system, but that markets and uncoerced human action provide a coordination process. Therefore, the argument we are defending is indeed radically *different* from the standard argument found in microeconomics textbooks, an approach which, for all the reasons we have given, we consider basically irrelevant and erroneous, whether it is viewed as a positive analysis of the real economy or as a normative analysis of how it should operate. The clearest sign that "welfare theory" is fallacious lies in the fact that, paradoxically,

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[53] In the words of Mises himself: "The mathematical economist, blinded by the prepossession that economics must be constructed according to the pattern of Newtonian mechanics and is open to treatment by mathematical methods, misconstrues entirely the subject matter of his investigations. *He no longer deals with human action but with a soulless mechanism mysteriously actuated by forces not open to further analysis*. In the imaginary construction of the evenly rotating economy there is, of course, no room for entrepreneurial function. *Thus the mathematical economist eliminates the entrepreneur from his thought*. He has no need for this mover and shaker whose never ceasing intervention prevents the imaginary system from reaching the state of perfect equilibrium and static conditions. *He hates the entrepreneur* as a disturbing element. The prices of the factors of production, as the mathematical

it has given rise to the idea that through its models and methods, the resource allocation mechanism could be resolved in a planned economy with no market. Economic equilibrium and welfare theory, which began as a descriptive, positive theory about the functioning of the market, has ended up being an instrument to advance, via its mathematical methods and models, a system of economic calculation which stamps out both the market process and its most intimate characteristic: entrepreneurship.[54]

economist sees it, *are determined by the intersection of two curves, not by human action*." *Human Action*, 702.

[54] Perhaps the first equilibrium theorist to recognize the radically different nature of the argument Mises and Hayek put forward in favor of the market was Richard R. Nelson, in his article, "Assessing Private Enterprise: An Exegesis of Tangled Doctrine," *Bell Journal of Economics* 1, no. 12 (spring 1981). We agree with Nelson when he states that "orthodox" welfare theory lacks relevance, but we do not share his idea that the theories of Hayek in particular, and of the Austrian school in general, though relevant, are in a very primitive stage of development. Such an assertion makes sense only if one considers any theory constructed with a high degree of formalism to be "developed," even if it is untenable and irrelevant, while also overlooking the important contributions the Austrian school has been making in all areas of economic science. As we saw at the end of footnote 2, even Mark Blaug has come to perfectly understand the fundamental differences between the Austrian and the neoclassical paradigms, as well as the irrelevance of the latter.