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# WASSILY LEONTIEF'S CONTRIBUTION TO ECONOMICS

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Whoever thinks of Wassily Leontief thinks of input-output, and vice versa. A review of Leontief's writings and career shows, however, that he cannot be summed up in a single accomplishment, no matter how stellar. To be sure, the discovery of input-output was his outstanding accomplishment, as it was one of the two or three outstanding achievements of a whole generation of economists. But Leontief is not a one idea, one gadget economist. On the contrary, the discovery of input-output might well be regarded as the almost inevitable result of the kind of economist that he is.

There is a dominant theme that runs through Leontief's four decades of professional work, from his earliest papers to his presidential address to the American Economic Association. It is that economics is an empirical and applied science, and that fancy theoretical apparatus can sometimes be helpful but is more likely to seduce students and scholars into intriguing but sterile bypaths. The only valid test of economic research is its empirical significance and its practical implications. This theme recurs again and again in his writings, in many guises. It is the basis of his famous attack on the Cambridge economists who surrounded Keynes,<sup>1</sup> it lies behind his profound paper on the structure of functional relationships,<sup>2</sup> it motivated the complaint in his presidential address against the disproportion between abstruse theorizing and factual digging in contemporary American economics.<sup>3</sup> But most important of all, it is the clue to his discovery of input-output economics.

Input-output economics is that *rara avis* in economics, a genuinely new and original idea. It was not without precursors and Leontief has always been at least adequately generous in acknowledging them. The idea of material balances connecting the levels of activity in different segments of the economy goes back to Quesnay and is deeply embedded in Marxist theory. The notion of a closed system of functional relationships connecting the activity levels of all components of an economy goes back to Walras at least. Nor did Leontief invent the mathematics of input-output analysis. What economists call "Leon-

<sup>1</sup> In "Implicit theorizing: a methodological criticism of the neo-Cambridge school." See bibliography.

<sup>2</sup> "A note on the interrelation of subsets of independent variables ..."

<sup>3</sup> Eighty-third meeting of the American Economic Association, December 29, 1970.

tief matrices" have long been known to mathematicians as "Frobenius matrices", and the main theorems concerning them were well worked out by the time Leontief was born, and were developed further over the years by a long succession of mathematicians. I still remember Leontief's gleeful excitement when he came across the work of Remak, who proposed a theoretical input-output formulation of an economy seven years before Leontief's earliest paper on the subject. A mathematician, H. E. Bray, had written in similar vein seven years before that.

But all of these are merely precursors who lacked the vital idea, so characteristic of Leontief, that formulas are mere playthings while real economics begins with operational concepts and, above all, actual numbers. It was Leontief, who first saw the practical potentiality of an input-output *table* and who learned how to really put one together. Next to this achievement the algebraic properties of input-output matrices—long known to mathematicians and for the most part rediscovered by economists other than Leontief—are only theoretical refinements. The fundamental discovery that distinguished Leontief's work from that of all his predecessors is that it was practical to calculate the input-output coefficients from recorded data, to perform the necessary algebraic manipulations, and to use the results to answer a wide variety of practical economic questions. The magnitude of the obstacles in the path of this achievement can be appreciated by remembering that it occurred ten years before the first electronic computer.<sup>1</sup>

One precondition for the discovery of input-output was the proper mental set, already described. The other was a strong mathematical background, needed both to grapple with the algebraic technicalities involved and to dispel the awe that neophytes sometimes feel when confronting elaborate algebra. Leontief satisfied this requirement, too, having been thoroughly trained in mathematics as a student. In short, the discovery of input-output was the accomplishment of a well-prepared mind confronting a problem for which it was ideally suited.

In the sequel, we shall first survey the intellectual development of this mind, and then revert to the discovery and development of input-output analysis.

## Leontief's Career

Leontief was born in Leningrad in 1906. The externals of his career give only a faint suggestion of its intellectual quality. He studied first at the University of Leningrad and then at Berlin, earning his doctoral degree at the age of 22.

<sup>1</sup> It is recorded that the first input-output solutions on an automatic computing machine required fifty-six hours on the primitive Harvard Mark II computer, for a 42 sector table. I do not know the times required for the previous computations, which were performed by an ingenious application of punchcard machines, but they must have been far greater. It took remarkable vision to perceive that the results could justify such enormously tedious calculations.

He engaged in economic research at the University of Berlin and then served for a short time as an economic advisor to the government of China. In 1931 he came to the United States, and after a brief period at the National Bureau for Economic Research he was appointed an instructor at Harvard University. There he has remained ever since, though not long as an instructor. He is now Henry Lee Professor of Economics at Harvard. During World War II he served as head of the Russian Economic Subdivision of the Office of Strategic Services. His honors include two Guggenheim Fellowships, an honorary degree from the University of Brussels, and the presidency of the American Economic Association.

In the course of his studies Leontief received a thorough mathematical training. Though, as I mentioned, Leontief has consistently been skeptical of applications of higher mathematics to economics, this fact has colored his entire career. In spite of all his protestations he thinks mathematically and quantitatively. Virtually all his research papers deal with the economic interpretation, application, and misapplication of some mathematical formulation used in economic theory or statistics. This is preeminently true of his contribution to input-output analysis. In most of these papers he displays phenomenal ingenuity in translating mathematical concepts into illuminating graphs and words—his papers are peppered with strikingly vivid and original graphic presentations that bring out the central idea of the argument, stripped of obscuring technicalities.

Leontief has not been particularly prolific. He has only one full-length monograph, *The Structure of American Economy, 1919–1929: An Empirical Application of Equilibrium Analysis* (Cambridge, Mass.: Harvard University Press, 1941, later editions by Oxford University Press, New York). He edited, directed, and contributed to a collaborative volume, *Studies in the Structure of the American Economy: Theoretical and Empirical Explorations in Input-Output Analysis*, with H. B. Chenery and others (New York: Oxford University Press, 1953). He has also published two volumes of collected essays, drawing upon his accumulation of some five dozen scientific papers. In addition to the usual scholarly contributions, he has published a number of lively expositions of his work in the *Scientific American* and elsewhere.

His earliest papers, beginning in the early 1930's, were those to be expected of a brilliant young economist whose interests had not yet congealed. There was a series of papers on the statistical estimation of demand and supply curves, foreshadowing his continuing concern with adapting theoretical constructs to empirical reality. There were expository and evaluative papers on a variety of subjects, including indifference curves (then quite novel), the interpretation of index numbers, and the theory of production.

Reread from a perspective of forty years, none of these are decisive and some are noticeably dated, but the reviewer is struck by repeated shafts of sheer brilliance and ingenuity. The 1933 paper on "The use of indifference curves

in the analysis of foreign trade" is typical. As an exposition of the use and interpretation of indifference curves, it is unexcelled. Some diagrams of striking ingenuity are devised to show how the community indifference curves and production possibilities curves of two countries interact to determine their trading relationships. But, there is no hint that the author has perceived the really fundamental problems in the construction and use of community indifference curves for the analysis for international trade, problems that were pointed out a few years later by Samuelson, Scitovsky, and others. In this case Leontief was clearly intrigued by the conceptual potential of the indifference curve apparatus but was not close enough to the problem to encounter the fundamental operational difficulties lying just below the surface. In short, this paper is extremely clever and technically adroit, but does not pierce to the substantive conceptual issues on which the whole analysis rests.

A few years later he published another paper of the same general quality, "Composite commodities and the problem of index numbers" (1936). This paper, more than the preceding one, exemplifies his life-long concern with the operational significance of economic concepts. The concept here in question is that of a general price level, purportedly measured by a price index. He takes it for granted, without discussion, that the correct measure of the price change between two periods is the change in the cost of attaining a given indifference curve. This is the modern standpoint but, as Leontief was well aware, it is inherently ambiguous. The ambiguity lies in the fact that the measured change in price depends upon the level of the indifference curve that is chosen as the basis of comparison, and this choice is necessarily arbitrary. The heart of the paper is an ingenious geometrical analysis that shows that none of the index numbers in use resolve this ambiguity or give estimates of the change in price that correspond to the correct one.

Although Leontief perceived the issue and demonstrated the inadequacy of all practical price index formulas, he did not push the analysis as far or as fruitfully as was done a few years later by Hicks and Samuelson who based their treatments much more explicitly than he did on the welfare significance of the different index number formulas. To the reader equipped with the hindsight provided by subsequent literature, it is apparent that Leontief grasped the basic issues in the construction and interpretation of price indices, but not quite firmly enough to advance our understanding of the problem.

These two examples will convey the general spirit and quality of Leontief's early work. It displays thorough technical mastery and a profound concern with the substantive meaning of the technical concepts, a concern that enabled him to perceive difficulties that he was not always able to resolve. His interests were as wide as economic theory and his critical acumen was sharp and effective. He continued to think and write in this vein even after he entered his middle period.

Leontief's middle period and major work began in 1936 when his first paper

on input-output appeared. This was "Quantitative input and output relations in the economic system of the United States". It is highly significant and characteristic that this paper, while based upon a novel and important contribution to economic theory, lays its major emphasis on the numerical description of the American economic structure.

From this point on, Leontief's work shows a decisiveness, authoritativeness, and focus not previously evident. He has, so to speak, hit his stride and his writings, whether dealing with input-output or other topics, display the assurance that comes from having discovered his own creative touchstone. It is no longer the work of a clever young man, but that of an experienced scholar who knows what he is doing, and therefore, what others should be doing.

From about 1934 on, Leontief's major efforts were devoted to the development of input-output and its applications, and to the direction of the Harvard Economic Research Project, which he founded and headed. At the same time his interest in other aspects of economics continued and even broadened. He published papers on the theory of international trade, the theory of noncompetitive markets, Marxian theory, the estimation of demand curves, aggregative economics, and other topics. A few of the papers from this period deserve special mention. The paper on "Implicit theorizing: a methodological criticism of the Neo-Cambridge school" (1937) was more than an attack on some of the presuppositions invoked by Keynes' followers. It was, at root, an exposé of the dangers of constructing definitions for theoretical argumentation in such a way as to build in the conclusions to be established, an insidious form of begging the question that is very likely to arise when theoretical arguments are divorced from empirical observations. This danger has nowhere else been so clearly exposed and this paper has stood as a warning to a whole generation of economists.

The papers on the internal structure of functional relationships have already been mentioned. The paper in *Bulletin of the American Mathematical Society* developed the mathematical theory of functions of several variables in which some of the arguments were separable—that is, in which some of the arguments entered the function only through some implicit subsidiary functional relationships. The paper in *Econometrica* explored the economic applications of such functions. In the theory of consumption these include utility functions, since the variables for the quantities consumed of different commodities can be grouped according to the purposes that those commodities serve. This insight was later developed further by Strotz (in his theory of utility trees) and by Lancaster. In the theory of production, which was Leontief's particular interest, separable variables arise when different primary inputs are used in different stages of an integrated production process to produce, in effect, different intermediate goods that are used in the final production process. Furthermore, this analysis resumes in a more fruitful way the problem of index numbers and composite commodities that Leontief essayed some ten years previously.

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The connection is that an index number is essentially a subsidiary functional relationship that incorporates the effects of a group of primary variables on some functional relationship that is being studied. These papers brought out the fundamental logical theory that underlies a wide variety of economic theories and concepts. Their full implications have yet to be exhausted.

As time went on, Leontief's interests evolved beyond the development of economic theory and moved toward its applications and even to broad problems of economic criticism. Especially in the 1960's he became increasingly sensitive to the limitations of automatic market adjustments and began to question seriously some of the assumptions on which orthodox economic theory is based. These new concerns are reflected most clearly in his articles in the *New York Review of Books* in which he reported his sympathetic impressions of the Cuban economic experiment, derived during a brief visit to that country. His publications then became widely scattered, including contributions to *Daedulus*, *Foreign Affairs*, the *Bulletin of the Atomic Scientists*, the *Harvard Law Review*, the *Harvard Business Review*, *Peace Research*, and repeatedly the *Scientific American*. In all of these articles he reached out to inform the general public of the fruits of his years of study of economic problems, again reflecting his rejection of the concept of economics as a pure, ivory-tower science. These articles reflect also increasing disquiet over fundamental inadequacies in orthodox economics. Leontief has clearly travelled a long way since his early defense of traditional economic analysis against the Keynesian attack. Where these most recent concerns will take him is still to be seen.

## Leontief and Input-Output Analysis

The discovery and development of input-output analysis is undoubtedly Leontief's major life work. I have already emphasized that although Leontief discovered the theory and essential mathematical properties of input-output analysis, he had been anticipated in this and it was by no means his main interest or contribution. He saw little purpose in laying out some algebraic relationships that other people might or might not implement. In his view the contribution of any economic theory lay in the light it threw on real economies and their problems, and the test of the significance of a theory lay in its ability to shed such light. The task of the theorist then only began with promulgating a new concept. The crucial task was to verify the empirical significance of the concept and the validity of its predictions, and this could be done only by practical, empirical observation. In so thinking, Leontief was following in the tradition of Newton who withheld publication of his theory of gravitation for twenty years, until he was able to show that the orbit of the moon conformed to it. Fortunately, Leontief did not have to wait for twenty years. In spite of severe obstacles he was able to construct numerical input-

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output tables for the United States in the middle 1930's. These first input-output tables were exceedingly crude by modern standards—hardly more advanced, comparatively, than the Wright Brothers' first airplane—but they did provide the needed empirical verification. They established that even at that time statistical resources and computational facilities were adequate to make the construction of input-output tables a practical enterprise. They also provided encouraging, though not decisive, evidence in favor of the fundamental empirical postulate of input-output analysis, the postulate that the structural input-output coefficients were relatively stable over time and over a reasonable range of changes in economic circumstances. With this evidence in hand, Leontief was confident that he had discovered a significant and useful tool of economic analysis. Indeed, he had.

Leontief's first, preliminary papers announcing his discovery appeared in 1936 and 1937. His definitive monograph, *The Structure of American Economy, 1919–1929*, was published in 1941. The monograph deserves our particular attention.

*The Structure of American Economy*, first edition, contained both theoretical and numerical discussions. The theoretical analysis was inspired, quite explicitly, by Walras' vision of a fully determinate general equilibrium system. Indeed, it was largely a severe simplification of Walras' equations, designed to make them empirically implementable. This simplification consisted in going back to Walras' original presentation of his system in which the inputs required for the production of each commodity were assumed to be simply proportional to the level of output of that commodity. But Leontief's reformulation included a significant, in fact decisive, innovation. Whereas Walras had subordinated the whole question of intermediate goods, the purchases of the various industries from each other emerged as the central set of equations in Leontief's system. What began as a bold simplification ended as a basic shift in the emphasis of the whole system.

In this first version of input-output analysis the reorientation was not complete. Leontief retained Walras' concept of an entirely self-contained, self-determining system of economic relationships. This was the "closed" input-output system, and the requirements for closing it not only introduced some technical complications that were later eliminated, but rendered the system inappropriate for studying the impact of external events and disturbances on the level of economic activity. However, only a minor shift in emphasis and abandonment of the goal of complete internal determination were required to put the system into its modern, "open" form. These changes were accomplished three years later, in "Output, employment, consumption, and investment", and incorporated in the second edition (1951).

The numerical analysis was correspondingly primitive, by subsequent standards, but correspondingly path-breaking. It consisted of the construction of two ten-sector input-output tables, one for 1919 and one for 1929, both



based primarily on data from the Census of Manufactures.<sup>1</sup> A ten-sector table is nowadays considered to be more like a pilot-model than a usable instrument of analysis, but all the essential conceptual and statistical difficulties had to be overcome to construct the first two, and tables of this size strained the computational facilities available in the 1930's. These tables, however limited for purposes of practical analysis, confirmed the empirical validity of the method and constituted the fundamental break-through. All the rest has been development and explication.

It is hard, now, to revive the excitement created by these first developments. The Walrasian general equilibrium theory was a scheme of economic interconnections in principle, which might be implemented in some future, visionary stage of the development of the science. With Leontief's papers that higher, more competent stage arrived abruptly. The time-honored theory was lifted suddenly out of the textbooks and treatises and placed in the arena of applied economic analysis.

There was a brief lag between the announcement and the effect, because nearly all economic research was in abeyance during World War II, but immediately after the war the ferment boiled over. The time was ripe. Statistical resources in the United States and other economically advanced countries were adequate or almost so. The electronic computer was clearly visible on the horizon, which meant that huge masses of data could be handled and appalling computations could be performed without difficulty. A new interest in quantitative methods was gaining ground in all branches of economic theory and practice.

Leontief published "Output, employment, consumption, and investment" while the war was still in progress. In it he introduced the modern "open" version of input-output and showed how it could be used to estimate the effect of postwar reconversion on the pattern of economic activity and employment. This was the first of his long series of applications of the technique to pressing economic problems.

Almost immediately after the war, the United States Bureau of Labor Statistics adopted the input-output method for its projections of manpower needs and employment opportunities. Leontief, of course, played a central role in this work. The resources of a major statistical agency made it possible to undertake very large and detailed input-output tables; eventually a table with more than 400 sectors was constructed.

Simultaneously, input-output analysis became a major field of economic research. The Harvard Economic Research Project, which is devoted to it, was founded in 1948 with Leontief as director. The first international conference on the subject was held in 1950. By 1955 an extensive bibliographic

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<sup>1</sup> Input-Output coefficients for a 44-sector table were compiled, but were consolidated into ten sectors for analysis, 44 sectors being far beyond the capacity of the computational facilities of the time.

compilation of research on input-output was in order; several others have followed. Three major international conferences on input-output have been held, and countless local and subsidiary ones. Several textbooks have appeared. Input-output tables of varying degrees of elaborateness have been constructed for at least 50 countries and for several subnational regional economies. The steady flow of work on input-output—theoretical, empirical, and policy-oriented—is so great that it merits its own category in the American Economic Association's current bibliographies of research in economics.

Leontief has remained in the forefront of these developments. For the past twenty-five years he has been applying the input-output approach to a succession of the most pressing economic problems of the day.

I have already mentioned "Output, employment, consumption, and investment" (1944). This paper developed the application of input-output analysis to the tasks of estimating the effect of post-war reconversion on the levels of employment and activity in different economic sectors. The problem has remained important ever since, and Leontief has published on it repeatedly, as in "The economic effects of disarmament" (1961) and "The economic impact, industrial and regional, of an arms cut" (1965). These papers have established input-output as a primary tool for assessing hard-headedly in some detail the importance of military procurement for maintaining the levels of economic activity and employment in the United States.

He first applied input-output analysis to the problems of international trade in "Exports, imports, domestic output, and employment" (1946). He returned to this application in 1954–56, in a pair of remarkable papers: "Domestic production and foreign trade: the American capital position re-examined" (1954) and "Factor proportions and the structure of American trade: further theoretical and empirical analysis" (1956). In these papers he used the input-output technique to estimate the relative capital and labor contents of American imports and exports, and was led to the surprising conclusion that American exports are more labor-intensive than American imports, a flat contradiction of received doctrines and current beliefs. This finding, though open to some question, brushed aside much superficial thinking about trading relationships and introduced a potent new method for studying them. The analysis was far from straightforward; the limitations of the data forced him to resort to highly ingenious, indirect methods of estimation and inference.

In 1946 also, Leontief initiated the input-output analysis of inflationary processes, in "Wages, profits, and prices". This paper showed how wage and price increases originating in different sectors of the economy are diffused throughout the price structure, and included quantitative estimates of the differential impacts of increases in different sectors. This, too, remains a current and important problem and the methods introduced by Leontief are among the most powerful ones we have for analyzing it.

Most recently, the impact of economic activity on the quality of the en-

vironment has become a prominent source of social concern. Input-output analysis is a natural tool for studying the burden imposed on the environment by different forms of economic activity. Leontief has contributed a significant paper to this field of application, "Environmental repercussions and the economic structure: an input-output approach" (1970).

Other applications of input-output analysis to practical economic problems are too numerous, varied, and well-known to be listed here, but one additional area of application is too fundamental to be ignored. Input-output analysis has proved to be an indispensable component of economic development planning. It is for this reason that input-output tables have been compiled for so many of the nations of the world—at least fifty—and for many subnational regions. These tables serve many purposes, such as indicating appropriate relationships among economic sectors and permitting estimates of import requirements.

These last two applications have coalesced in Leontief's current work. He is now directing a large study under the auspices of the United Nations, in which he is using the input-output technique to examine the environmental implications of the United Nation's strategy for promoting the development of the less developed countries. This study is likely to result in recommendations for altering that strategy in the interest of protecting and preserving the world environment, and for encouraging the less-developed countries to give more weight to local environmental impacts in designing their own development policies.

This recital of applications and Leontief's role in them makes clear that input-output has had a larger impact on economic analysis than any innovation since the development of national income accounting and the Keynesian mode of aggregative analysis. It did not add any fresh, substantive insights to economic theory. On the contrary, its contribution lay in demonstrating that for many important purposes some of the time-hallowed insights, particularly those concerned with optimizing behavior, could be ignored, leading to a greatly simplified and practicable set of economic relationships. In short, input-output is a bold simplification of economic theory. Its substantive content, which required statistical and empirical confirmation, is that this austere simplified model still conforms well enough to observed economic relationships to be informative for many purposes. This could not have been foreseen a priori, and the discovery that it was so, constituted one of the great economic discoveries of our generation.

Although Leontief's preponderant interest has been in pioneering in the application of input-output to practical issues, he has been deeply concerned also to extend the theory and thereby widen its practical potential. Two extensions have preoccupied him especially. One is temporal or dynamic, the study of the level of investment in different sectors from the input-output point of view. Leontief has devoted great effort to this extension, including the compilation

of a detailed table of capital coefficients for the United States and the publication of a series of papers on the theory of dynamic input-output models. But, for a number of statistical and theoretical reasons that do not have to be reviewed here, this effort has not proved to be nearly as fruitful as the basic, static theory. It appears that the simplifications that make static input-output analysis so useful—in particular fixed input-output coefficients, a single producing sector for every commodity, and a single commodity for every sector—are not appropriate for dynamic analyses, in which a wider scope for economic choice is of the essence. For this reason dynamic input-output analysis has remained, largely, a textbook theory. In studies of economic development, where it has been applied *faute de mieux*, it has not proved very reliable.

The other urgent extension to which Leontief has devoted himself is spatial, the study of interregional and international trading relationships. This effort has been greeted with somewhat greater success. Interregional trading relationships, however, do violate the basic assumption of “one commodity, one source” and no fully satisfactory substitute for this postulate has been discovered for this context. This field also, therefore, cannot be counted among the most successful applications of input-output analysis.

In spite of these evident limitations, it is clear that input-output analysis has been one of the most fundamental and fruitful innovations in economic analysis in recent decades. It is not an advance in economic theory proper—in some respects it is a retreat—as much as in the art of applying economics to practical problems. The exact nature of the contribution is illuminated by fortuitous coincidence. In 1960 Piero Sraffa published *Production of Commodities by Means of Commodities: a Prelude to a Critique of Economic Theory*. In it he presents a very elegant independent discovery of the theoretical basis of input-output analysis. But, in contrast to Leontief’s work, there are no numbers; only the closely-reasoned, logical underpinnings. And therein lies all the difference between an insightful contribution to economic theorizing and the discovery of a practical new tool of analysis. Sraffa was content to present some interesting and important logical relationships; Leontief was not content until he had showed how they could be measured and confirmed empirically, and applied to practical problems. It is the implementation that makes the discovery significant.

### Concluding Remarks

I have reviewed above Leontief’s contributions to economics in general and to input-output analysis, his outstanding achievement. This review reveals him as having an extraordinarily keen mind with a strong critical and empirical bent. He has, in addition, great technical and logical skill. Oddly enough, though he has contributed a major innovation, novelty and originality are

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not what Leontief seems to strive for in his work. It seems, rather, that he was driven to his innovation by his sharp critical acumen and his dissatisfaction with conceptual abstractions devoid of empirical counterparts. In input-output analysis and elsewhere he made his discoveries by starting with a traditional concept that dissatisfied him and striving to bridge the gap between that concept and the observable phenomena that it purported to describe.

Now this is nothing but the heart of “scientific method”, as contrasted with “philosophic method”. It is analogous to, say, Einstein’s recognition that astronomical positions and velocities could not be observed absolutely but only relatively to one another, so that absolute position and velocity have no empirical referent. The ability to perceive the flaws in concepts that have long been taken for granted is a precious and rare one in all sciences, and especially so in economics where the “philosophic” (or a priori) and “scientific” (or empirical) approaches exist side by side. Leontief has this ability to a superlative degree. We have seen several examples, particularly input-output analysis and the study of index numbers. It is especially instructive that the record of his work contains not only the finally-perfected, highly-polished result of his researches, but, in both these instances, rough-hewn, indecisive way-stations along his road to clear understanding. It is almost as if were privileged to participate with him in the slow, vexatious drama of discovery. It is even illuminating that in some instances—one has been cited above—he failed to ask quite the right questions and to make his characteristic contribution.

Thus, Leontief stands, near the end of his career, as the model of the scientific method in economics. I cannot think of anyone who excels him in this regard among living economists. He is not a polemicist (as, say, Keynes was), though deeply motivated by social concerns. He is not an abstract theorist (like, say, Samuelson, whose scientific studies are nearly devoid of empirical verification and have little to do with his applied policy-oriented writing). He is not a descriptive empiricist (like, say, Kuznets). He, rather, combines all three orientations. He refines and revises theoretical models and concepts to render them empirically meaningful, and confirms them. He is preoccupied, hard-headedly, with the meaning and meaningfulness of the technical words and concepts that he uses and with interpreting economics in practical terms. To resort to a faddish word, he is and always has been concerned with the “relevance” of economics and with its application to “relevant” problems.

Herein lies his preeminence. The student of economics, of any age or stage, could do far worse than review Leontief’s work on any topic to see scientific economics exemplified at its best. The discovery of input-output is a fitting capstone to his combination of scientific soundness and technical brilliance.



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