

*The* SOUTHERN ECONOMIC JOURNAL

July 1952

## A DIAGRAMMATIC ANALYSIS OF COMPLEMENTARITY\*

NICHOLAS GEORGESCU-ROEGEN

*Vanderbilt University*

Introduction.—I. Interpretations of the principle of decreasing marginal utility.—II. First graphic interpretation of Edgeworth-Pareto complementarity.—III. Second graphic interpretation of Edgeworth-Pareto complementarity.—IV. Translation of the preceding interpretation into Allen-Hicks schemata.—V. Derivation of Edgeworth-Hicks diagrams.—VI. Limiting cases.—VII. A new interpretation of the basic postulates used in consumer's theory.

On the theoretical and, even more, on the pragmatic usefulness of the concept of complementarity, opinions seem to be thus far strongly divided. Even the latest milestones in the literature of economic theory take opposing views on the matter. On the one hand, Professor Samuelson, in his *Foundations* (p. 183), expresses the view that "the problem of complementarity has received more attention than is merited by its intrinsic importance." On the other hand, in the second edition of his *Value and Capital*, Professor Hicks persists in using the concept of complementarity as one of the main theoretical backbones of his economic analysis.

Not only the world's best economists, but thousands of other serious students of economics have spent, and are still spending, "considerable time and energy" in the study of Professor Hicks' book.<sup>1</sup> A great deal of this time and energy is occasioned, I believe, by the absence of a link between the verbal argument of the main text and the mathematical proofs presented independently in the Appendix; for, unlike Marshall or Pareto, Hicks does not offer an adequate diagrammatic analysis to bridge the gap between the two types of argument. The primary purpose of the present paper is to provide such a bridge.<sup>2</sup> The non-mathematical reader will find here a new diagrammatic analysis which, it is hoped, will help him to handle almost any problem involving complementarity.<sup>3</sup> This diagram-

\* The author wishes to acknowledge the assistance he received from the Institute of Research and Training in the Social Sciences at Vanderbilt University.

The presentation of this paper benefited from the criticism made by Professors Jesse W. Markham, William H. Nicholls and Paul A. Samuelson.

<sup>1</sup> Samuelson, [23], p. 184. Also Machlup, [17], p. 297. (The list of references appears at the end of the paper.)

<sup>2</sup> The basic results presented in this paper, especially those of Sections I-VI, have been used by the author since 1949 in his graduate classes at Vanderbilt University in place of verbal or algebraic proofs (Cf. Hicks, [11], pp. 1 and 45). The paper was read, for the first time, before the Economics Seminar of Vanderbilt University on April 19, 1951.

<sup>3</sup> The concept of complementarity considered in this paper is of a purely static nature, i.e., it presupposes constant tastes. But complementarity has other aspects, even more