$$X_i = C_i + \sum_{j=1}^{n} X_{ji} \qquad (i = 1, \cdots, n).$$

Labor, the $(n+1)$st good, is thought of as the sole nonproduced good, and its given total $X_{n+1}$ is allocated among the different industries so that

$$X_{n+1} = \sum_{j=1}^{n} X_{j,(n+1)}.$$

Let each good be subject to a production function $F_i$ which is homogeneous of the first order. Equilibrium requires that any $C$, say $C_1$, be at a maximum subject to fixed values of $X_{n+1}$ and the other $C$'s. This means that

$$C_1 = F_1(X_{11}, X_{12}, \cdots, X_{1,(n+1)}) - \sum_{j=1}^{n} X_{j1}$$

is to be a maximum subject to

$$C_i = F_i(X_{i1}, X_{i2}, \cdots, X_{i,(n+1)}) - \sum_{j=1}^{n} X_{ji} \qquad (i = 2, \cdots, n),$$

$$X_{n+1} = \sum_{j=1}^{n} X_{j,(n+1)}.$$

Samuelson's theorem asserts that the maximizing values $\{X_{ij}\}$ are such that the $\{X_{ij}/X_i\}$ are independent of the fixed values $C_2, \cdots, C_n, X_{n+1}$.

Linear programming of an economy is a matter of allocating the available resources so as to maximize the utility of the economy. Mathematically the problem is one of maximizing a linear function of several variables constrained by linear inequalities. Dantzig proves that this problem is equivalent to the problem of solving a zero-sum two-person game. More general results are given by Gale, Kuhn, and Tucker, who prove general duality and existence theorems. (For nonlinear programming see Kuhn and Tucker, *Proceedings of the Second Berkeley Symposium on Probability and Statistics*, pp. 481–492.)

An introduction to the volume by Koopmans gives descriptions of the papers and their interrelations.

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*Classical mechanics*. By H. Goldstein. Cambridge, Addison-Wesley, 1951. 12+399 pp.

This book gives an advanced course in classical mechanics, with