

Theory of the Firm: A Reformulation with Primary Factors of Production and Procurement of Ingredient Inputs

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Abstract

This paper reformulates the neoclassical theory of the firm by distinguishing two types of inputs: (1) the primary factors of production (labor, capital, etc.) and (2) ingredient inputs (intermediate goods, raw materials, and services). The production function is defined on the space of the primary factors while ingredient inputs, as required by production technologies, are procured externally from other firms. Firms maximize profits subject to the production function as well as to the ingredient input requirement functions. We analyze how the optimal level of production and the optimal employment of factor services are determined when the cost of the acquisition of ingredient inputs is counted explicitly as part of the total cost of production. The first order condition of profit maximization requires that the marginal value-added product of an employed primary factor be equal to its price, and the second order condition is stated in terms of the negative definiteness of the Hessian of the value-added function. Cost minimization requires that the marginal cost of production be equal to the sum of an incremental cost of factor services and an incremental cost of ingredient inputs that are procured. The optimum level of production and the optimal use of the primary factors both respond to changes in the prices of ingredient inputs. The paper also shows: the zero degree homogeneity of factor demand and output supply functions, the linear homogeneity of the value-added function, Shephard's lemma, the interpretation of the Lagrangian multiplier in cost minimization, the nonlinearity of the iso-cost surfaces, and the concavity of the cost function.

Keywords: primary factors, ingredient inputs, production function, value-added function, marginal value-added product

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