DETERMINANTS OF PRODUCTIVITY DIFFERENCES IN INTERNATIONAL MANUFACTURING

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Abstract. To access the influence of various factors on labor productivity, a production function model of a plant in a labor-intensive consumer goods industry is developed and estimated econometrically. The model is derived from a production function specified in three functional forms which is expanded to include management and quality-adjustment factors for the capital and labor inputs. The management variable is a performance ranking of the plants in terms of meeting output, quality, and cost goals. Data on approximately 30 plants from a dozen countries over the period 1975 through 1982 was used for the analysis. All of the plants are of a single multinational firm and produce similar products. Results indicate that for this firm the most important determinants of labor productivity differences among the plants are the management and worker-related factors. Managers who consistently met their output, quality, and cost targets also had high labor productivity plants. Worker skill levels were also found to be positively related to productivity and strong learning-by-doing effects were apparent in the plants. Additionally, the Latin American plants were found to have significantly lower labor productivity which none of the included variables was able to fully account for. Varying returns to scale, first increasing and then decreasing, were noted in this industry.

INTRODUCTION

In recent years, economists have voiced increasing concern about a slowing of the growth rate of productivity in the U.S. and other industrialized countries. Much speculation has taken place as to the cause of this slowdown from the much higher rates of the 1950s and 1960s and some

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empirical investigations have been carried out. Yet, the studies usually have resulted in a fairly large residual factor that is left unexplained. The predictable effects of slowing of capital investment, unfavorable demographic changes, slowed application of new technology, and aging equipment are often found in these studies. However, only a portion of the productivity slowdown is typically explained by these factors. It appears that some major variable or variables that affect productivity are "missing." The research described in this paper attempts to explain the residual by introducing several new variables which may influence productivity. Most productivity studies are based upon a production function that relates output to several factor inputs. Capital and labor are usually included as factors of production and occasionally materials and energy are added. Land is often used in agricultural studies but is usually not considered a major input for industry. However, an important input to the production process would seem to be excluded from these investigations. That input is management which determines how the other factors of production will be combined and how efficiently they will be utilized. This deficiency in productivity research apparently results more from the difficulty of measuring management input than from a belief that management is unimportant to productivity. Yet, there is substantial research evidence that indicates management contributes to efficiency differences. That evidence will be presented later in this paper.

Another characteristic of many production function-based productivity studies is the assumption that factor inputs are homogeneous. A worker or labor hour is assumed to have the same productivity for all observations. Capital is assumed to incorporate similar levels of technology and rates of output and firms only differ in the amount employed. These homogeneity assumptions seem unrealistic. In this study several variables will be added that will adjust for lack of homogeneity of factor inputs, including variables for worker skill and motivation levels and technology level of the plant. Other factors that may influence productivity are the specialization and experience of the plant and the ratio of staff personnel to line workers. Nelson [1981, p. 1044] has noted, "to the extent that firm structures and decision-making style are important variables influencing productivity, this fact in itself cautions against thinking of the determinants of labor productivity simply in terms of the quantity of complementary inputs and technology. A richer set of variables is involved. These variables may, and likely do, influence productivity in the average firm as well as the extent of interfirm dispersion."

To be able to incorporate these factors in a production function it will be necessary to use plant-level data. Most productivity studies have been done at industry or economy-wide levels. An aggregate approach makes it impossible to measure adequately many of the micro variables that this paper argues may be important determinants of productivity. Primarily this is a problem of finding adequate measures of the management and the heterogeneity variables at an aggregate level. The important decisions