MARKETING STRATEGY AND THE USE OF INFORMATION TECHNOLOGY: NEW EVIDENCE FROM THE TRUCKING INDUSTRY

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ABSTRACT

Since the mid-1980s, many authors have investigated the influence of information technology (IT) on productivity. Until recently there has been no clear evidence that productivity increases as a result of IT spending. This productivity paradox is partly due to the difficulty in correctly identifying outputs, particularly in a service sector such as the trucking industry. Products are often differentiated by quality attributes of the service provided, rather than merely the physical content of the good delivered by motor carriers. A carrier's primary marketing objective, e.g. on-time performance vs. lowest-rate carrier, is precisely what differentiates a trucking firm's service. This paper uses cross-sectional data to show that the use of increasingly sophisticated IT by trucking firms varies depending upon marketing objectives. Our empirical results imply that, in order to measure the impact of IT on productivity, it is crucial to account for how the firm differentiates its product. We conclude that the productivity paradox can be alleviated if measures of output incorporate firms' marketing objectives.

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1. INTRODUCTION

Did a university's 1980 investment in new Vax computers help faculty and students be more productive? Does investment in a satellite communications network improve the productivity of UPS workers? Ten years ago, the answers to similar questions were either "maybe" or "no," and this productivity paradox of information technology (IT) fueled a large body of literature.[1]

Brynjolfsson and Hitt (1998) summarize the key reasons for the productivity paradox with the following humorous passage:

> Productivity is a simple concept. It is the amount of output produced per unit of input [yet productivity] is notoriously difficult to measure ... In particular, there are two aspects of productivity that have increasingly defied precise measurement: output and input.

More recently, better data and a clearer understanding of how to measure both outputs and inputs have begun to reveal that use of technology may in fact improve productivity. Using cross-sectional data, this paper finds that the use of increasingly sophisticated IT by trucking firms depends on marketing objectives. Marketing objectives are defined by a firm's competitive strategy, and these objectives are met by product differentiation. Our empirical results imply that, in order to measure output precisely, it is crucial to account for how a firm differentiates its product.

Evidence of a connection between a firm's use of IT and its marketing objectives would suggest that these traditionally intangible variables add a new dimension to the firm's measured output. If this is true, then productivity studies (even at the firm level) may need to include the firm's objectives to identify output correctly. Measured output can no longer be limited to simply counting widgets.

Measures of productivity – defined as the effect of IT on output – must incorporate a firm's competitive strategies. This connection of IT with competitive strategy is important for understanding one of many reasons the productivity paradox initially existed. Suppose two trucking firms provide the (seemingly) exact same service – the delivery of heavy machinery. Yet one firm has on-time performance as its most important objective, while the other firm markets itself as having the lowest freight rate. Each firm uses IT differently depending on how each markets its service, even though both may deliver one machine per day. If output is measured as the number of machines delivered, the relationship between productivity and IT use will be mis-measured. The on-time performer delivering an asphalt spreader to a construction site two hours late can count its output as zero. The lowest-rate carrier moves that same spreader when it is idle from one storage site to another. If that delivery is a few hours late it is still a productive day. The on-time performer will differentiate its

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