Technology Beats a Full House:
The Empirical Relationship between IT Intensity and Performance Heterogeneity

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May, 2009

A great deal of information technology (IT) research has focus on the effects of IT on firm performance. (see, for example, reviews by Stiroh (2002), and Brynjolfsson and Hitt (2003)). This work is has largely focused on the average effects of technology, but has been largely silent on the variation in returns across firms. In this paper, we examine the variation in performance associated with increased levels of IT spending in various industries over time. We use data from the Bureau of Economic Analysis's annual Tangible Wealth Survey to derive measures of IT intensity and we determine intra-industry performance heterogeneity using data from firms’ annual reports by calculating a suite of performance measures including profit margin, return on assets, and market capitalization per dollar of revenue across all firms in each industry. Analyzing data from 1962 to 2007, we find that IT-intensive industries experienced a sharp and statistically significant increase in performance spread among member firms beginning in the mid 1990s, while non IT-intensive industries did not. This result is a robust to a wide variety of measures and specifications.

We hypothesize that this change may result, in part, from modern corporate IT’s ability to standardize and replicate business innovations such as improved processes. In this context 'modern' means after the mid 1990s; this was the period large-scale commercial enterprise systems became broadly available to firms in many industries. This technology innovation greatly increased the span of a given process innovation, as well as the speed and fidelity with which it could be propagated. In particular, we demonstrate that when process innovations propagate more rapidly within firm boundaries than across firm boundaries, information technology will tend to amplify the firm-specific effects of innovations and thereby increase performance heterogeneity. Our model further predicts that the same technologies will be associated with increases in average productivity levels, intra-industry turbulence and intra-industry concentration. We find that all of these predictions are also borne out in the data.

We conclude that significant changes in industry competition occurred beginning in the mid-1990s and that these changes were strongly correlated with the IT-intensity. These changes are consistent with our understanding of IT’s role in propagating innovations in these industries.