The relationship between technology, innovation, and firm performance—Empirical evidence from e-business in Europe

Philipp Koellinger\textsuperscript{a,b,c,d,*}

\textsuperscript{a} German Institute for Economic Research (DIW Berlin), 10108 Berlin, Germany
\textsuperscript{b} Erasmus Research Institute of Management, Rotterdam, The Netherlands
\textsuperscript{c} Tinbergen Institute, Rotterdam, The Netherlands
\textsuperscript{d} EIM Business Policy Research, Zoetermeer, The Netherlands

\section{Introduction}

The importance of new technologies and innovations for competitiveness and growth is a truism among managers, policy makers, and researchers. However, not all new technologies and innovations lead to success. Given the manifold technological opportunities and types of innovations from which firms can potentially choose, it is desirable to know which innovative activities and technologies are most clearly associated with improved competitiveness and growth. Arguably even more important is an understanding of the factors that make the success of new technologies and innovative activities more or less likely in general. The aim of this article is to provide some new insights regarding this topic.

A conceptual framework is developed that assists in analyzing the relationship between technology, innovation, and firm performance. It is argued that the performance implications of new technologies, such as information and communication technologies (IT), are mediated by innovative activities that result from the adoption of these technologies. Furthermore, the performance implications can vary across different types of innovation, depending on firm-internal and market-specific factors. This conceptual framework serves as a guide for the empirical investigation and the interpretation of its results.

The empirical part of the study compares the performance of innovative and non-innovative companies. Performance is measured in terms of turnover development, employment development, and profitability. In particular, four different types of innovative activity are distinguished: product innovations or process innovations that were enabled by Internet-based technologies, and product innovations or process innovations that were not related to the use of Internet-based technologies. The article is organized as follows: succeeding this introduction, the theoretical...
The relationship between innovation and profitability is more complex because it critically depends on the reaction of competing firms. The fundamental problem for the innovator is to protect its novel process or product from imitation by rivals. As soon as all competitors use the same (improved) process and produce the same product, no single firm in the market will be able to outperform its rivals, including the firm that first brought the innovation to the market (Teece, 1986, 2006). The quicker an innovation is copied by other firms, the less time each innovating firm has to reap additional payoffs from the investment in the innovation. This is known as the appropriability problem (Geroski, 1995). Thus, the timing of an innovation influences the expected payoff. The game-theoretic literature points out that firms that are able to outpace their direct competitors in technological development will capture market shares and profits from their rivals, possibly up to the degree that they drive their competitors out of business. However, profits from innovation are only sustainable until competitors are able to copy the innovation and all associated complementary assets completely. In addition, potential early mover advantages will be limited or even reversed if the technologies on which the innovations are based exhibit either falling prices or rapid technological improvements over time (Beath et al., 1995; Fudenberg and Tirole, 1985; Götz, 1999; Reinganum, 1981). Summarizing, economic theory predicts that successful innovators are more likely to grow and to survive in their markets. Various empirical studies are consistent with this message (Audretsch, 1995; Cefis and Marsili, 2003; Mansfield, 1968). They might also be able to capture excess profits, but this is contingent on the behavior of rivals and on other exogenous factors that are beyond the control of the innovator (Geroski et al., 1993; Stoneman and Kwon, 1996).

Various empirical studies also show that innovating firms fail to obtain competitive advantages from an innovation, while customers, imitators, and other industry participants benefit (Levin et al., 1987; Teece, 1986). To circumvent this problem, firms typically try to appropriate private returns from innovation using a wide range of mechanisms, including patents, secrecy, lead time advantages, and the use of complementary capabilities (Cohen et al., 2000). Methods of appropriability vary markedly across and within industries, and not all methods work well in all cases (Harabi, 1994; Levin et al., 1987; Teece, 1986).

A different vein of the literature analyzes the firm-level impacts of investments in new technologies, often without linking such investments explicitly to innovation. The consequences of investments into IT have especially been subject to an intense debate among scholars because not all studies have demonstrated clear payoffs from IT (Brynjolfsson and Hitt, 1996, 2000, 2003; Hitt and Brynjolfsson, 1996; Carr, 2003; Chan, 2000; Kohli and Devaraj, 2003).

A particular advantage of seeing the adoption of new technologies as an enabler of innovation is that it allows us to identify the firm- and market-specific mechanisms that can lead to different consequences for firms that invested

---

1 The products or services represented by these production functions may be substitutes from the consumer’s perspective and/or they may vary in quality. Thus, a new production function does not necessarily reflect a radical innovation.
2 Assuming the new good or service is not a close substitute to other goods or services offered by the firm.
3 Assuming the price elasticity of demand is large enough.
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات