

Chapter 44

Resources on the Stage: A Firm Level Analysis of the ICT Adoption in Turkey

Derya Findik

Yıldırım Beyazıt University, Turkey

Aysit Tansel

Cornell University, USA

ABSTRACT

This study examines the impact of firm resources on ICT adoption by the Turkish business enterprises using firm level data. The data for this study consists of 3633 firms in manufacturing and services sectors. We investigate the effect of firm resources on the adoption of ICT by using ordered logit model. Adoption of ICT is an index variable including four categories which ranges from single technology ownership to four technology ownership. These technologies are local area network (LAN), wireless local area network (WLAN), intranet, and extranet. We assume that these technologies are complementary. We find that firms do not need to use same amount of resources while adopting single technology as they would while adopting complementary technologies. In the adoption of complementary technologies, the effect of firm size, trade openness, human capital, purposes of ICT usage and environmental factors such as region and industry increases. On the other hand, full complementarity among technologies does not require the full exploitation of the firm resources. As a result of inefficient use of firm resources, single and two technology owner firms, which are composed of resource-limited small and medium sized enterprises (SMEs), do not accomplish the technology adoption benefits of the three and four technology owners. We discuss a set of policy implications to promote the efficient use of firm resources for single and two technology owner firms. The effect of firm resources on the adoption of complementary technologies is analysed in this study which has not been investigated before in this context.

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INTRODUCTION

The adoption and the use of Information and Communication Technologies (ICTs) are indications of technological progress and important keys for the development of knowledge-based economy and its future sustainability. The existence of ICT infrastructure provides business opportunities and helps firms build up business networks between suppliers, buyers and customers. A large number of business tasks are succeeded through the internet by means of personal computers and external network facilities which, in turn, decrease the transaction costs. Moreover, use of ICTs provides an efficient channel for advertising, marketing and direct distribution of goods and services. ICTs play a dual role in the business world. It is both a technology stock of the firms and a channel for technology transfer from one firm to another (Hsieh & Lin, 1998).

Recent years witnessed an increasing trend in the use of ICT components by firms in Turkey. For instance, according to the results of the Survey of ICT Usage by Turkish Enterprises, the use of intranet has increased by 50 percent in between 2007 and 2009. A similar trend is observed in the use of extranet which increased by 65 percent during the same period. The functions of these two technologies are complementary. Intranet focuses on the internal communication of the firm while extranet organizes the firm's external relations. We assume that the presence of these technologies together will increase the efficiency of the firms' internal and external communication. We, therefore, focus on the adoption of the complementary technologies in this study. Adoption literature more focuses on the complementarity effect of ICT on the work organization (Bresnahan et al., 1999; Arvanitis, 2005). In that case, the adoption of ICT necessitates the reorganization of the work processes which ultimately affects firm productivity.

In our study, we analyse the mechanisms that shape the adoption of complementary technologies. We, therefore, pose the following research questions:

RQ1. Does adopting single technology require the use of same amount of firm resources as adopting multiple complementary technologies?

RQ2. Does full complementarity among technologies imply full exploitation of the firm resources?

Answering these questions carries a strategic importance for the firms for two main reasons. These are firm resources and adoption costs. We categorize firm resources as firm size, human capital, prior technological knowledge, foreign share, trade openness, purposes of ICT usage, industry and the region. Firms with different resources may show different adoption behaviours. Bearing costs of adoption is strongly linked to the presence of these firm resources. For instance, concerning the effect of firm size and prior technological knowledge on the adoption of the technology, in most cases, small firms which have difficulty in bearing initial costs of adoption do not make initial software investment required for the adoption of the new technology. Without prior knowledge on the technology, those firms lock-in the single technology. This situation poses the second research question. In the adoption of complementary technologies, there could be a threshold at some point to exploit the firm resources. We investigate the presence of this threshold in this study.

This study contributes to the related literature in at least three ways. First contribution is that this study elaborates the complementarity feature of the technology within the ICT adoption framework. Some of the empirical literature focuses on the time of adoption and the adoption intensity (Hollenstein, 2004; Lal, 2001) while some of them deals with the functions of the technology (Arvanitis, 2005; Shiels, McIvor, & O'Reilly, 2003; Luchetti & Sterlacchini, 2004). We assume that the complementarity

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