What drives ICT adoption by SMEs? Evidence from a large-scale survey in Greece

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1. Introduction

It is widely known that the industries and businesses of today’s new economy evolve and change rapidly, mainly as a result of the wide diffusion of Information and Communication Technologies (ICT) within organizations. New technologies enable and facilitate a broad range of business activities related to the storage, processing, distribution, transmission and reproduction of information (Fabiani, Schivardi, & Trento, 2005; Ongori & Migiro, 2013). In addition, ICTs may induce dramatic changes in businesses’ internal processes, radically altering firms’ structure, organization and operations (Spanos, Prastacos, & Poulymenakou, 2002), with organizational and output changes sometimes considered as spillover or indirect effects from investing in new technologies (Black & Lynch, 2004; Bresnahan, Brynjolfsson, & Hitt, 2002).

A significant volume of research highlights the fundamental role of ICT for productivity and economic growth at the macroeconomic level (Colecchia & Schreyer, 2002; Bart Van Ark, O’Mahony, & Timmer, 2008), the industry level (Inklaar, O’Mahony, & Timmer, 2005; Pilat, van Ark, & Lee, 2003; B Van Ark, Inklara, & McGuckin, 2003) as well as the firm level (Arvanitis, 2005b; Black & Lynch, 2004; Bresnahan et al., 2002; Brynjolfsson & Hitt, 2003). Remarkably, it has been found that the divergence of productivity growth between the USA and Europe observed during the 1990s can be explained by the different use of ICT in the sectors of these economies. The findings of Van Ark et al. (2003), for example, identify investments in ICT as a major contributor to the higher productivity growth of the USA compared to Europe in the second half of the 1990s.

At the firm-level, there is empirical evidence of the substantial contribution of ICT to firm performance in terms of labor productivity (Arvanitis, 2005a, 2005b) as well as multifactor productivity and output growth (Brynjolfsson & Hitt, 1996, 2003). Indeed, the gains of integrating and using ICT are multiple and touch upon diverse aspects of intra- and inter-firm business operations and transactions, being in turn reflected in firm performance. Focusing on SMEs, relevant literature underlines the benefits of adopting ICT in terms of cost savings, organizational effectiveness, improvement of services to customers and suppliers, access to new business opportunities and market information, competitiveness, internationalization (Fulantelli & Allegra, 2003; Ghobakhloo, Sadegh Sabouri, Sai Hong, & Zulkifli, 2011; Ongori & Migiro, 2013; Tan, Chong, Lin, & Eze, 2010) and, more generally, productivity and growth (Barba-Sánchez, Martinez-
From a policy perspective, promoting the acquisition of new technologies within SMEs has been given high priority at the European, country and regional levels. However, due to various resource limitations and a lack of understanding of the ICT-related opportunities, SMEs face increased difficulty in adopting the new technologies (Chapman, James-Moore, Szczygieł, & Thompson, 2000; Nasco, Toledo, & Mykytyn, 2008; Thong, 2001) in many developing as well as developed European countries. This is the case of Greece, where the overall economic activity is traditionally dominated by SMEs, which, despite the progress they have made in recent years, still appear to lag behind the European average in assimilating new technologies and engaging in e-business activities (European Commission, 2016). At a turning point on its way to rebalancing, growth in Greece must be inextricably linked to the new technological priorities established within Europe in light of the digital and ICT revolutions. To this end, the successful design and implementation of appropriate policy plans and schemes require adequate knowledge on the factors that affect business decisions with respect to the adoption and use of ICT within SMEs.

Significant contributions on the topic utilize data derived from small-scale surveys on SMEs, usually referring to specific industries, regions and/or technologies (e.g., (Alshamaila, Papagiannidis, & Li, 2013; Chapman et al., 2000; Dholakia & Kshetri, 2004; Kurnia, Choudrie, Mahbubur, & Alzougoud, 2015). In the Greek context, Spanos et al. (2002), using survey data from 91 leading companies with an average firm size of 515 employees, identify significant relationships between ICT adoption and some changes in strategy, organizational structure, management systems and human capital skills. Considering solely SMEs, Buhalis and Deimezi (2004), based on both secondary and primary data, provide evidence of the limited penetration of ICT and e-commerce in the Greek tourism industry. Papastathopoulos and Beneki (2010), using survey data for 54 Greek SMEs in their two-way analysis of ICT and e-commerce in the Greek tourism industry, Papastathopoulos and Beneki (2010), based also on survey data from 278 employees in Greek SMEs, examine personal computer acceptance patterns using a structural model. Finally, the results from logistic regressions for 100 Greek SMEs participating in a questionnaire-based survey undertaken by Pontikakis, Lin, and Dimbergas (2006) highlight the role of previous experience in the adoption of internet-enabled personal computers.

Overall, the limited extant evidence on ICT adoption by Greek firms concerns either a single technology or a specific industry and/or is based on data from rather small-scale surveys on SMEs or firms of larger size, making the generalizability of the results questionable. What is more, the direct effects of several factors such as the ICT skills of personnel, R&D activities and research collaborations of firms on ICT adoption have not been systematically explored in the case of Greek SMEs. To fill this void, the present paper explores whether and to what extent ICT penetration within Greek SMEs is driven by firms’ technological competencies, internal organization and human capital of the workforce. The empirical analysis is based on a rich dataset derived from a large-scale survey of 3500 SMEs that operate across a range of industries in Greece. Importantly, it examines five indicators of ICT adoption capturing different aspects related to firm intentions for ICT use, ICT infrastructure, internet integration and e-commerce applications. By offering empirical evidence from a large sample of Greek SMEs, this study aims to advance our knowledge on the factors and mechanisms involved in the process of ICT adoption in SMEs, providing at the same time relevant policy and managerial implications.

The paper is structured as follows. The next section presents the conceptual framework of our analysis along with the hypotheses to be tested. Section 3 describes the data and the methodology used for the empirical analysis. The results are presented and discussed in Section 4, whereas Section 5 concludes the paper.

2. Conceptual background and hypotheses formulation

The adoption process of new technologies has been studied from many theoretical perspectives (e.g., Grandón, Nasco, & Mykytyn, 2011; Lee & Xia, 2006). Oliveira and Martins (2011), reviewing the literature on technology adoption models, consider the theory of diffusion on innovations (DOI) (Rogers, 1995) and the technology, organization, and environment (TOE) framework (Tomatzky, Fleischer, & Chakrabarti, 1990) as the most prominent models being particularly relevant to firm-level studies. Both models highlight individual as well as firm characteristics related to technology and organization as drivers of innovativeness. The TOE framework, additionally, recognizes the significant role of the environmental context—referring to industry, competitors, and deals with the government—in the process by which the firm adopts and implements a technological innovation.

Drawing from the aforementioned theories, the conceptual model underlying this study (see Fig. 1) emphasizes the role of technology-related factors as well as internal organization characteristics in shaping a firm’s decision and adoption behavior with respect to ICT intentions, ICT infrastructure, internet integration and e-commerce (e-sales and e-procurement). In this context, a firm’s technological capabilities as well as scientific knowledge and ICT skills are considered significant technology-related factors that are likely to affect adoption decisions and ICT implementation.

In particular, a firm’s technological competency, being explicitly linked to ICT adoption, is represented in our analysis by significant improvements or innovations in the firm’s functions, R&D activities and participation in research projects/collaborations. Human capital is considered separately, referring to the scientific educational background and the ICT skills of the SMEs’ staff. These factors are largely linked to the ‘technology complexity’ used in the theoretical context provided by Rogers (1995) to describe the degree to which an organization’s members possess a relatively high level of knowledge and expertise. The role of human capital is also recognized and separately assessed by other influential studies on technology adoption determinants (Bayo-Moriones & Lera-López, 2007; Spanos et al., 2002).

Regarding internal organization, our model suggests that ICT adoption is affected by the extent to which the decision-making process is decentralized and the presence of a visionary leading team committed to growth-driven goals. According to Rogers (1995), centralization is a key internal characteristic of organizational structure referring to “the degree to which power and control in a system are concentrated in the hands of a relatively few individuals”. In addition, within DOI theory, the leader’s attitude toward change represents the individual characteristics that are considered crucial in firms’ adoption behavior.

The model also controls for a number of firm- and environment-specific structural characteristics (firm size, industry and location) in explaining ICT adoption, as illustrated in Fig. 1. The following sections describe the way in which the abovementioned factors are expected to affect ICT adoption based on existing theoretical and empirical evidence.

1 Other theoretical models that have been utilized in the technology adoption literature use an individual level of analysis as, for example, the theory of planned behavior (Ajzen, 1985, 1991), the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and the technology acceptance model (Davis, 1989). More holistic approaches also consider impacts of ICT drawing on the structure-conduct-performance paradigm (Hidalgo & López, 2009). For a critical review of relevant theories and models on the determinants of e-commerce and ICT adoption, see Pieter and De Maree (2011) and Grandón et al. (2011).
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