



The co-evolution of ICT, skills and organization in public administrations: Evidence from new European country-level data[☆]



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ABSTRACT

During the past two decades a big effort has been made in exploring the complementarities between information and communications technology (ICT) adoption, investment in human capital and organizational change, and how these affect economic performance. Such investigations, however, remain substantially circumscribed to private sectors, while the role of these factors in public sector performance has been largely disregarded.

In this paper we aim at filling this gap in empirical literature by combining different data-sources and constructing a panel of comparable data about output quality, input costs, ICT investments, skills and organizational changes in public administrations of 16 European countries. We propose an index-based approach to the measurement of PA performance relying on the adoption of public e-services as a proxy of revealed output quality, and provide an econometric analysis of how the co-evolution of ICT, skills and organizational factors affects government effectiveness.

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1. Introduction

During the past two decades a great deal of attention has been directed to the social and economic impact of the broad category of information and communication technology (ICT) innovations. Most of the systematic quantitative research by economists on this theme has focused on the issue of how the productivity and profitability of business organizations is affected by “ICT investments”. In particular a big effort has been made in exploring the complementarities between ICT adoption, investment in

human capital and organizational change, and how these affect economic performance. Such investigations, however, remain largely confined to private sectors. Both at the macro and micro levels extensive econometric analyses have been applied to the manufacturing sectors of different countries in the form of growth accounting analyses of ICT effects on economic performance (see e.g., Machin and van Reenen, 1998; Acemoglu, 2002; Bartel et al., 2007) and detailed patterns of adoption within business firms (Brynjolfsson et al., 1997; Caroli et al., 2001; Vivarelli et al., 2004; Cetto and Lopez, 2010). A few works also explore the complementarity issue for market services in comparison with manufacturing industry (Zand et al., 2010) and with specific reference to business firms involved in web based activities (Zhu, 2004; Koellinger, 2008). The general point emerging from this extensive empirical literature is that the adoption of ICTs fosters new organizational practices and requires new labor skills. Only actions simultaneously

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involving all these three variables can positively affect economic performance and avoid the so-called Solow paradox, i.e., an insignificant, or even negative, impact of ICT diffusion on the firm or sector competitiveness and productivity (Draca et al., 2006; Brynjolfsson et al., 1997; Caroli et al., 2001; Vivarelli et al., 2004).

Such investigations, however, remain largely confined to private sectors. While important insights can be drawn from this relatively wide range of studies, to the best of our knowledge there is very limited systematic evidence on the complementarity story in the case of public administrations (PAs thereafter).

The lack of research on the links between ICT, organizational change, skill structure, and performance of the public sector is mainly due to the conceptual and analytical problems encountered when estimating output for non-market sectors. The absence of prices for non-marketed output of PAs is one of the key issues that make it difficult to measure productivity and other performance indicators in public sectors and their determinants. A wide literature about the measurement of public sectors' output is surveyed in the "Handbook of public administration" (Peters and Pierre, 2003) which concludes that "only some quantitative performance measures will be indicators at best and not highly accurate or informative measures of a program's value or effectiveness". The result is that scant attention has been devoted to the investigation of the ICT effects on PA productivity, nor to the accompanying changes taking place among the organizational structures and skills composition of PA.

We submit that the complementarity between ICT investment, organizational change and human capital should be observed also in the case of PAs. However, human capital investment and organizational change play a key role as a drivers of performance in the case of public sector, over and above ICT. This has to do with the very nature of public services. These activities typically involve a variety of interdependent actors on both the supply and the demand sides, which are engaged in the co-production of output and pursue different and often conflicting sets of values and objectives (Djellal and Gallouj, 2008). From this perspective, ICT adoption alone can hardly enhance public sector performance. ICT investment needs be combined with a significant effort to improve skills and organizational structure and behavior. This might be even more the case when PAs are considered, due to the complexities of knowledge and information flows *within* individual PAs, *across* different PAs and *between* PAs and external actors (citizens, communities, firms and other institutions). It is the availability of more qualified workers and the introduction of substantial organizational innovations that makes it possible to deploy new public services. In fact the delivery of new services increases the need for public administrations to: adjust their internal information management and enable interoperability, organize communication with intermediate and final users, and design services with the support of ICT tools and digital networks. In other words, in the absence of appropriate combinations of human capital and organizational change one can expect that PAs will also experience the well known paradox pointed out by Solow in the 90s for private sectors, i.e., a throughout

evidence of ICT investment except in output and productivity statistics.

In this paper we aim at filling this gap in empirical literature by combining different data-sources to analyze the co-evolution of ICTs, skills and organization in PAs and their effect on productivity. To this aim we construct a panel of comparable data about output quality, input costs, ICT investments, skills and organizational changes in PAs of 16 European countries in 2003–2007. Our analysis of complementarities will adopt the general standpoint suggested by Ballot et al. (2011): "the complementarities perspective is not itself a theory of organizational design, but rather an approach to help researchers to understand relational phenomena and how the relationships between parts of system create more value than individual elements of the system". In our econometric exercises we will operationalize this approach by simply testing how our proxies of ICT expenditure, human capital and organizational change affect alternative measures of PA output; and whether these regressors impact on our dependent variables in the same direction, hence reinforcing – or moderating – each other's effect on public sector performance¹.

In the next section we review extant literature on ICT, skills, organizational change and productivity in public sectors and highlight the conceptual and analytical problems underlying the lack of comprehensive empirical studies at the country level on this issue. Section 3 presents the strategies adopted here to overcome the data shortage. In Section 4 the empirical exercises are described and results commented. Section 5 concludes.

2. Public sector performance and complementarities: a review of the literature

To examine the role of ICT, skills and organizational change in public sector performance, two separate sets of conceptual and empirical issues need be tackled. First, one has to address the serious analytical problem of measuring performance in the case of public sector. Second, one needs to evaluate how ICT affects public output and the role of complementary factors involved. We present below a review of extant literature addressing each of these to issues.

2.1. Measuring performance in the public sector

The analysis of performance in service sectors has traditionally posed a number of conceptual and methodological problems (Griliches, 1984). In the case of public sector, this task is even harder to tackle. One may mention at least three specific sets of largely unresolved issues (Baxter, 2000;

¹ Antonioni et al. (2010) use a similar empirical strategy based on interacted terms to study how complementary factors affect economic performance, although with reference to a very different context. Of course we are aware that other rigorous but perhaps less parsimonious methodologies have been utilized to explore the joint effects of technology, organization and skills, although with almost exclusive reference to private sectors. See Mohnen and Roller (2005) for an extensive review of empirical literature aimed to test complementarities in innovation practices.

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