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# Innovation, workers skills and industrial relations: Empirical evidence from firm-level Italian data

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ABSTRACT

The shifting of labour demand toward relatively more skilled workers has been a hot issue in the economic field for many years. A consolidated explanation for the upskilling phenomenon is that technological–organisational changes have driven the labour demand with detrimental consequences for less skilled workers (*skill-biased technological–organisational change*). In order to upgrade the skill workforce the firm has at least two main channels at its disposal: the external labour market strategy, mainly based on hiring and firing mechanisms; the internal labour market strategies, which improve the skill base of the employees through training activities.

The main objective of the present work is to verify the relations between innovative strategies and both the workforce composition and the training activities, within an integrated framework that also leads us to consider the role of specific aspects of the industrial relations system.

The firm level analysis is based on original datasets which include data on manufacturing firms for two Italian local production systems, located in the Emilia-Romagna region.

The results suggest that the firms use both the two channels to improve their skill base, which is actually related to the innovation activities, although there is weak supporting evidence of the use of external labour markets to upgrade the workforce skills: the upskilling phenomenon seems to be associated to specific innovative activities in the technological sphere, while specific organisational aspects emerge as detrimental for blue collars. On the side of internal labour market strategies the evidence supports the hypothesis that innovation intensity induces the firms to implement internal procedures in order to upskill the workforce, confirming the importance of internal labour market strategies. Moreover, we have recognized the important role of firm level industrial relations in determining the training activities for the blue collar workers.



## 1. Introduction

During the last decades western developed economies have experienced increasing inequalities within the labour market. The sharp increase in wage inequality, especially in Anglo-Saxon countries, between skilled and unskilled workers has been considered as a result of the rapid spread of new technologies. The wage effect of technological change is just one side of the inequality phenomenon; the other one concerns the labour demand. The shifting of labour demand in favour of better-educated/skilled workers, with a detrimental effect for less-educated/unskilled workers, appears to be soundly verified in several empirical studies.

The causal direction of the relation between innovation and skills, above mentioned, is just one side of the coin. The flip side calls into question the role of the human capital in affecting the ability to innovate of an economic system, as put forward by the seminal work of Nelson and Phelps (1966). Hence, the likely co-evolution between skills and innovation makes it difficult to chose a causality direction rule generally applicable. Indicators of knowledge and human capital are used as proxies of innovation "enablers" (Innobarometer, 2009), that is to say they are considered as the fertile ground that makes it easier to innovate and to create sustained competitive advantages.

Knowledge is also perceived as a crucial element for the competitiveness of production units such as firms (Nonaka and Takeuchi, 1995). At firm level the linkage between human capital and innovation is not trivial at all, especially when the interactions between innovation and high/low skilled workers are considered. For example, on the one hand, we may question whether technological change complements the high skilled workforce performance or if it acts as a substitute for less skilled workers or both. On the other hand, it can be argued that technological change may efficaciously complements some high skilled workers performances but not

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others, or it may substitute for some less skilled activities but not for others (Autor et al., 2001).

The same argument goes for the linkages between organisational changes and skills. It has been argued (Lindbeck and Snower, 1996) that recent trends in organisational change, involving decentralisation, reduction of hierarchical levels and introduction of high performance work practices, are potential factors explaining the increasing demand for skilled workers. At the same time, the changes in labour organisation may be called for supporting high levels of workers' skills (Bartel et al., 2007).

In the present work, we acknowledge the role of human capital and workers skills as complementary to innovation activities. The purpose of the paper is to verify the association between the skill composition of the workforce and the training activities, on the one hand, and innovations in technology, organisation and ICT on the other hand. In so doing, we aim at identifying the role of the distinct strategies in augmenting the skill base each firm may rely on: recurring to the external labour markets and recomposing the workforce structure hiring new employees (owning the desired skills); implementing training programs in order to widen the skill base of the existing workforce. The former strategy is essentially in line with the traditional skill biased technological and organisational changes literature, but it does not take into account the role of internal labour markets, which may be extremely relevant, especially for labour markets characterised by certain rigidities in the hiring and firing processes. The micro focus of the work, which relies on empirical data stemming from original surveys on manufacturing firms, allows us to use a wide set of information, also regarding industrial relations characteristics, to be intended as cooperative employment relationships at firm level, as potential influencing factors of the workforce skills formation. The data at our disposal allow us to consider the role of innovation and industrial relations on training programs implemented by the firm, deepening our understanding of industrial relations influence, coupled with innovation activities, in firm strategic decisions concerning the human capital development of the workforce.

The paper is organized as follows. Section 2 presents a review of both theoretical literature and empirical evidence regarding the relation between skills and innovation, focusing on traditional literature concerning the so called skill biased technological and organisational changes and on a less developed literature regarding the role of internal labour markets in the skill upgrading process. Section 3 outlines some stylised facts on the local context considered and Section 4 illustrates the data and the empirical model. In the following section the main results of the empirical investigation are discussed. Section 6 is left to concluding remarks.

## 2. Related literature

During the last thirty years the principal OECD countries have experienced significant changes in the functioning of labour market and an increasing inequality between different types of workers (Acemoglu, 2002). In particular, relative wages and the number of qualified (skilled) workers seem to be constantly risen (Autor et al., 1998; OECD, 1996); in the same period the number of underqualified (unskilled) workers has strongly decreased (OECD, 2001). By country these changes have been very heterogeneous according to different institutional characteristics of national labour markets. It appears that in Anglo-Saxon countries, characterized by more flexible labour markets, the decrease in the demand for unskilled workers has led to increasing wage differentials between skilled and unskilled workers (wage effect). On the contrary, in countries with less flexible labour markets, the change in demand has conducted to rising unemployment for unskilled workers (occupational effect) (OECD, 1996). Not by chance some authors notice in the unemployment rise in Europe the flip side of the rise of earnings inequality in the US (Freeman, 1995).

Thus, what is the mechanism that led to this evidence?

The consolidated explanation calls for technological change and the potential bias it may induce on labour demand. Many authors see a causal relationship between the technological change and the radical shift in the occupational structure (Berman et al., 1994; Sanders and ter Weel, 2000; Autor et al., 2001): the so called "Skill-Biased Technological Change" (SBTC). The SBTC has spurred an abundant empirical literature[1] at international level. Focusing the attention on the empirical works regarding the Italian context we find the following bunch of studies. Casavola et al. (1996) demonstrate that wage dispersion does not increase in Italy by the same extent as in the Anglo-Saxon countries,[2] furthermore technological progress lead to a significant increase in the employment of white collars. As Bratti and Matteucci (2004) put in evidence the SBTC in the manufacturing industry can assume different forms according to the specialization and pattern of development of a country. In Italy, for instance, the authors find that from 1995 to 2000 only the R&D expenditures (and not the ICT variable) have negative and significant impact on unskilled (production) workers.[3] Finally, a more recent work by Baccini and Cioni (2005) on the Italian textile district of Prato (an Italian province in Toscana), compares current occupation and occupation during the early Eighties. The comparison reveals that technological innovation, in particular changes introduced with ICT, is not necessarily skill biased. It appears, in fact, that technology spreads at different speeds: some of it biased in favour of skilled labour, some are neutral and some biased in favour of unskilled labour.

However, the SBTC is not the only explanation of the recent up-skilling of the workforce. Another hypothesis, suggested more recently, is deeply rooted in the evolutionary theory of the firm. This second stream of the literature is based on the idea that the increasing diffusion of new organisational structures and new work organisational practices is an important explanation of the increase in the demand for skilled workers (Lindbeck and Snower, 1996; Caroli and Van Reenen, 2001). Actually, the changes occurred in the firms organisational structure in the last decades have directly impacted on economic performances (see as examples for the Italian case: Antonioli, 2009; Antonioli et al., 2010) and on the human capital of the firms. The theory of the "Skill-Biased Organisational Change" (SBOC) asserts that decentralisation, delayering, team work, multi-tasking and all what is generally called *High Performance Work Practices (HPWP)* necessitate of more responsible and autonomous workers, with higher skills. Because the SBOC interpretation is more recent than the SBTC the empirical evidence supporting it is less abundant.[4] For the Italian economy two important empirical studies provide evidence of the SBOC. Piva et al. (2005), estimating a SUR model with over 400 manufacturing firms, show not just that OC is more important than R&D expen-

[1] For supporting evidence see the works on Anglo-Saxon countries (e.g. Bartel and Lichtenberg, 1987; Berman et al., 1994; Autor et al., 1998; Morrison Paul and Siegel, 2001; Machin, 1996), while less supporting evidence is provided by empirical works on European countries (e.g. Goux and Maurin, 2000; Mairesse et al., 2001; Aguirregabiria and Alonso-Borrego, 2001). Interesting results come also from recent empirical works regarding the role of SBTC in transition economies (Esposito and Steherer, 2009).

[2] Probably both the shift in the supply of skills and the features of the Italian wage bargaining system counteracted the rise in earnings dispersion (Casavola et al., 1996).

[3] Maybe this result is due to the specific traditional Italian sectors, composed prevalently by small and medium enterprises, where the formalized innovative activity is not intense and has low capacity to absorb qualified workers (Bratti and Matteucci, 2004).

[4] Some interesting empirical works that confirm the SBOC hypothesis are: Caroli and Van Reenen (2001), Falk (2001), Caroli et al. (2001) and Bauer and Bender (2004).