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**Quaderni di ricerca del
Dipartimento di Scienze Economiche
"Hyman P. Minsky"**

Anno 2009 n. 5

Education, Informal Learning and Development of Key Competencies in Workplaces. The Importance of Organizational Design

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January 2008

(Revised version – March 2009)

Abstract

The objective of the study is to test the hypothesis that growth in a worker's competency level is affected by a number of educational, training and workplace features. The focus is on the expressed competencies. Our findings show the strong statistical significance of five variables corcerning organizational nature of the workplaces, whereby employees: (i) have participated in improvement groups; (ii) have submitted improvement suggestions; (iii) have been interviewed for performance evaluation purposes; (iv) receive constant information flows; and (v) are involved and consulted by the organization. The cross-sectional nature of the estimates raises typical questions concerning: (a) the endogeneity of some variables; (b) the problem of selection bias with respect to certain variables and, lastly, (c) the heterogeneity issue. These problems are addressed by using the following test procedures: (1) the introduction of variables related to personality traits to capture individual fixed effects on the organizational variables, as well as the use of a two-stage procedure (TSLS) to control for the endogeneity of employee tenure; and (2) the use of the White method of robust standard error to control for the heterogeneity of the residuals. The selection bias issue is examined in argumentative form, as there was no information in the database that would make it possible to deal with it in econometric form. However, the relevance of the hypothesis is borne out by the outcome. The policy recommendations that can be derived include the implementation of: (A) employee-management agreements to redesign workplaces in accordance with the findings of the study; (B) public policies designed to encourage the re-engineering of workplaces in line with the processes under way in the main countries of Central and Northern Europe.

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1 Introduction

Nobel Prize-winning economist J. J. Heckman has tackled repeatedly the economics of learning and training over the past few years (Heckman, 2000; Heckman, Lochner and Taber, 1998; Heckman, Lochner and Todd, 2003). In reviewing the international literature, both theoretical and empirical, he came to the conclusion that (after 50 years of regressions) Mincer's earning function has weaknesses, puzzlements and ambiguities. Yet, he put fresh emphasis on the issue, by acknowledging that:

i) training is a dynamic process;

ii) skill begets skill, which is tantamount to recognizing a form of path dependence in the construction of competencies, and most of all:

iii) 'much learning takes places outside of schools: post-school learning is an important source of skill formation that accounts for as much as one third to one half of all skill formation in a modern economy (this estimate is made in Heckman, Lochner e Taber, 1998)' (Heckman, 2000, p. 5).

All this leads the author to conclude that if account is taken, over time, of both the sequential resolution of the uncertainty related to educational choices and the value of the various options, 'the internal rate of return - a cornerstone of classical human capital theory - is not a useful guide to policy analysis'(ibidem).

Heckman's research is devoted to the identification of the factors that affect the formation of cognitive and non-cognitive capabilities in pre-school years. He found (Heckman, 2007) that the original environmental conditions, parents' capabilities and genetics are the production technology of the abilities that individuals develop cumulatively throughout their lifecycle. Actions taken to ensure that the pre-school years are varied, well-provided-for and well-structured are conducive to greater efficiency in future learning. On the other hand, Heckman does not seem to pay much attention to post-school learning, even though the economic literature shows that work activities, *too*, are a significant albeit indirect source of learning, with such concepts as Arrow's learning-by-doing (1962) Rosenberg's learning-by-using (1982), Lundvall's learning-by-interacting (1988) and, lastly, Cohen-Levinthal's learning-by-searching (1990). Nor is Heckman very helpful in the identification of the skills that can be learned more easily outside of schools (technical and specialized skills or transversal skills?), or of the specific environmental characteristics (workplace, community, family, etc.?) that might play a role in 'shaping' an individual's capabilities, abilities

and skills. However, there is poignancy in his authoritative assertion that much learning takes place outside of schools (between one-third and 50%).

There are two suppositions that might provide an explanation. One is workplace attitudes, or habits developed within the organization that are independent of personal dispositions. Workplace attitudes may be the result of a management style and/or the approach of the individual manager, or of the sharing of common experiences by workers, which set the standards to which new recruits adhere progressively (due to the effect of informal learning) (Schneider *et al.*, 1995). Bartel *et al.* (2004) show the existence and persistence of a genuine workplace effect on the individual worker's perception of her role and organization, adding to the findings of previous research the notion that workers' attitudes are strongly correlated also to the firm's performance.

The second supposition about the origin of informal learning is related to organizational design, as this is the source of the stable and socially recognized *work practices* that employees are required to perform daily.

While the former focuses on individual learning as opposed to group attitudes, the latter claims that organizational design is responsible for group attitudes.

All these arguments and considerations, much as they diverge in quantitative terms and differ from a qualitative point of view, may be regarded as an indication of the critical conditions, or at least of the reduced influence, of school learning. This was brought to the fore also by the skills paradigm, which is one of the key points in the debate on education policy. Such critical conditions (as argued in Leoni, 2006a) are not related so much to the way access to knowledge is organized as to knowledge structure and classification, to the transmission of the fundamental concepts of the various disciplines, to long-standing practices to educate the mind and, finally, to cognitive mechanisms that are activated in the learning process by experience, that is mechanisms triggered in the presence of the actual processes through which people constantly structure/restructure their knowledge and experience, adapting their skills to the situation at hand.

The arguments put forth raise the question as to why the traditional institutions in charge of education are no longer the unquestioned leaders in the formation of the human capital stock.[1] This is an even greater concern, given that Western democracies put their faith on education to achieve a transition from compensative to opportunity welfare, based on the idea of empowering every

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[1] Human capital is widely accepted to mean as a highly codified and formalized body of knowledge and capabilities, which is formed and transmitted through an organized technical and scientific training system that revolves around schools and universities. The latter, however, are but the last stage of an education process involving the human capital stock of a country, whose foundations lie in schools, starting from primary schools.

individual by *transferring capabilities* instead of *resources* (Paci, 1997). Accordingly, the institutions responsible for the production and transmission of knowledge (traditionally schools and universities, as well as professional training programmes – suffice it to think of life-long learning projects) should have played one of the most important roles in ensuring lasting employability and social inclusion.

The inquiry into the reasons why learning takes place to such a significant extent outside of the educational and training schools leads to three possible explanations, which we will explore in this paper (§ 2). These include: (1) the change in the nature of work that is taking place with the pervasive expansion of information and communication technology (ICT) and the growing uncertainties determined by the globalization of markets; (ii) the new organizational forms of the firm (*lean production* and *community-of-practice*), where learning is *the* new type of work (Zuboff, 1988, p. 494), and , lastly (iii) the acceptance of the principle that 'knowing' is not an objective process, as knowledge is the product of a mental activity that modifies the reality under observation and study and, as such, thrusts learners and their ability to acquire knowledge into a central role. Such acceptance underpins the reappraisal of the ways individuals and firms learn.

The objective of this paper is to investigate the role played by the organizational design of workplaces, where stable and socially recognized work practices are conducted by workers on a daily basis, in improving the level of the skills acted out or expressed by workers. Special attention will be paid to the so-called «transversal» skills, which are considered in the debate on life-long learning as applicable to all workplaces, regardless of industry and company size. This because one of the firm's most valuable assets is not just, or largely, technical knowledge (as this can be more easily duplicated or transferred with the mobility of workers), but the cultural knowledge associated with employees' external relations, social skills and ability to interact. In this paper we call these 'relational' skills, 'problem solving' skills and 'teamwork' skills.

The analysis will review both the concept of firm as a *High Performance Work Organization* (HPWO) and the theories of job design (§ 3). It then will move on to build an econometric model (§ 4), which will be tested using a recent database constructed by ISFOL[2] (§ 5), following a national survey on a significant sample of workers on the organizational conditions of their workplaces and the learning sources of the skills acted out or expressed. The relevant findings will be discussed in § 6 while the econometric problems of endogeneity, selection bias and heterogeneity in the estimates will be addressed in § 7. Our closing remarks will be presented in § 8.

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[2] ISFOL is an Italian institute for the development of vocational training of workers. The database is labelled under the acronym OAC (Organizzazione, Apprendimento e Competenze – Organization, Learning and Skills).

2 A brief review of the three possible explanations

The reduced importance of the theory of human capital to explain learning processes is due to the very approach of the theory, which treats investments in education on the same footing as investments in physical capital and links the stock of knowledge obtained from the educational system deterministically to the output of the production system, without any analysis of the learning process (a task assigned to psychologists) or any attempt to acknowledge that school learning does matter in an ergodic world, i.e. in a world where knowledge passed down intergenerationally in classrooms and academia is basically unchanged (North, 2005).[3] Anyway, part of the responsibility for letting the theory's shortcomings 'lying asleep' rests with the scores of economists and sociologists who, over the past 15 years (overwhelmed by new technologies, globalization of markets and uncertainty), have paid scant attention to the profound changes in the «nature» and «contents» of work and in the «organizational forms» in which work is performed. In fact, these are the aspects that both prove and indicate the shift in the venues where skills that can be used by business organizations are learned.

In our opinion there are three possible explanations for the diminished role of «classroom» learning with respect to the skills demanded by the new productive context.

The first explanation as to why learning takes place increasingly in workplaces is given by Cainarca and Zollo (2001). Both authors stressed the diffusion of labour (and relationships between firms and their employees) that is based less on "mechanical energy", where tasks are predictable and identifiable (and the required energy easy to calculate), and more on «work», which is understood to signify the outcome of skills used or acted out "in production activities where variability and uncertainty are such that knowledge cannot be codified and incorporated into the machine, in other words where tacit knowledge prevails over explicit knowledge and only learning is standardized".[4] In turn, this requires the labour force to acquire a new set of skills, including

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[3] In this paper, knowledge does not mean scholarship or erudition but the type of expertise required by business firms.
[4] Cainarca e Zollo (2001) refer to a concept by Arendt (1958), whereby "labour" does not identify the finished product, the result of the activity, but the ability to perform or fulfil, whereas the product is invariably related to the word that indicates the "work", that is the implementation or completion. According to these authors [p. 111], "By extension labour is the production process proper, as a sequence of steps that does not result independently in a tangible and identifiable product. On the other hand, work can be identified with the finished product as a 'type of independent existence' "

management, diagnostics (control-supervision-improvement-innovation) and interpersonal skills. [5] Still according to Cainarca and Zollo (2001, p. 108), the experience of uncertainty in the action – and the resulting discretionality of the acting party - convinced the observer of the inefficiency of scientific management, which accepted the knowledge coming from the «classroom» and concentrated on the organization of labour. This because in the face of uncertainty human activities tend to be mainly cognitive and communicative, which does not give any signal through body language (central aspect of Taylor's analysis, 1911), but is sensitive to changes in how world events are interpreted.[6]

The second explanation refers to organizational theories, specifically to those that show that the lean production (Womack, 1990) and HPWO (*High Performance Work Organization*) (Appelbaum et al., 1994, 2000) models deliver better results than the Taylor and Ford models, as they *prompt* organizational learning by both the worker and the firm. This new model features a flat and lean organization, where emphasis is placed on the design and implementation of interfunctional activity systems focusing on processes (rather than on functions) and the customer (Womack *et al.,* 1990; Coriat, 1991; Davenport, 1993; Hammer and Champy, 1993; Kenney and Florida, 1994). The internal complementarities of this new design are constituted by bundles of new work practices, which include teamworking, job rotation, information sharing and wide consultations of employees, suggestion systems, appraisal and incentives to learn (Ichniowski *et al.*, 1997; Black and Lynch 2001, 2004; Brynjolfsson and Hitt, 2000; Caroli and Van Reenen, 2001; Brynjolfsson *et al.*, 2002; Brynjolfsson and Hitt, 2003; Bauer, 2003; Cristini *et al.*, 2003; Zwick, 2004).[7] These organizational traits in turn allow individuals to develop the creation of organizational knowledge and the firm to control resources that cannot be easily reproduced (Prahalad e Hamel, 1990; Teece e Pisano, 1994; Teece, Pisano e Shuen, 1997), mindful that knowing both *how* to learn and how to learn *more*

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[5] According to Cainarca e Zollo (2001), these skills are manifested through a 'social' and 'dynamic' process, where specific activities are performed, such as *interpreting* (the search for, and comparison of, explanations lay the groundwork of skill as a social construction), *talking* (discussions preserve the variety and ambiguity of interpreting, making it possible to shape complex organizational actions), *placing* (skills are placed in courses of action in order to preserve the specificity and richness of the construction of the organizational action), *arguing* (skills manifest themselves as arguments, incorporating into the relational complexity of language facts that are strong, clear and shared, on one side, and weak, elusive and enigmatic, on the other) and, lastly, *evoking* (as evocation, the manifestation of skills brings forth ex post the potentiality of rational constructs already held).

[6] According to Accornero (2000), modern firms are competitive mainly as a result of the quality of their products and services, and such quality is a function of *how* work is performed. Total quality demands a new quality of work and work relationships.

[7] Two other dimensions supplementing internal organization. One is an external network of productive units related by mutual trust; over time, these relationships turn into partnerships and, as such, entail high repetitiveness and intensity (Becattini, 1987; Brusco, 1989; Butera, 1990; Lorenzoni, 1990; Tràu, 1999). The second dimension reflects a new competitive strategy, which changes from «war of position» (e.g. barriers to entry, product differentiation policies, etc.) to «war of movement» (Stalk *et al.*, 1992)*,* based on the attitudes of internally flexible organizational units.

rapidly than the competition is the best source of a competitive advantage that can hardly be duplicated by rivals (Prahalad e Hamel, 1990; Ulrich e Lake, 1990; Senge, 1992).

The third possible explanation is rooted in the activation of mechanisms for the production and dissemination of knowledge conceived by Nonaka e Tacheuchi (1995), supplemented by those theorized by Argyris e Schön (1996) on the correction of errors, which are relevant for the Total Quality Management paradigm. First of all, Frasman (1994, 1998), who was inspired by Dretske (1982), as well as Nonaka (1994) and Nonaka and Taleuchi (1995) showed that there is a difference between information and knowledge: the former is an alphanumerical code while the latter is a belief produced (or supported) by information. To that effect, Polanyi (1958, 1966) provided a significant contribution by drawing a distinction between tacit and codified knowledge. Tacit knowledge is considered extremely personal, hardly codable (aspects that can complicate its communication or sharing with others) and characterized by subjective elements, intuition and clues. It is embedded in individual action and experience, as well as in ideals, values and personal emotions. Codified knowledge is considered transmissible through a formal and systematic language, is related to past events and objects, aims to work out a decontextualized theory and is originated by a sequence of activities (Bateson 1972). According to Nonaka and Takeuchi (1995), knowledge creation is based on the social interaction between the two types of knowledge indicated by Polanyi. The result of the interaction in question is nothing but a «conversion» – in one of four well-known ways[8] – of the one into the other. This conversion can give rise to an actual «knowledge spiral», in the sense that interaction between the tacit and explicit dimensions tends to expand, if management takes an «ontological» view of the problem, that is if middle management in particular facilitates the interaction of workers' skills and capabilities by empowering human resources through their involvement and rotation, teamwork, employee suggestion systems, delegation of responsibilities, distribution of information, learning incentives and, finally, interaction with (internal and external) suppliers and customers.

Even though it is based on information input, the creation of knowledge entails more than just the processing of such information, contrary to what is held by much of the traditional economic literature,[9] as learning takes place through the values-based, cognitive algorithm (or software) of the individual, which includes *also* intuitions, perceptions, creativity, recombination abilities, and

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[8] These channels are socialization (transmission of knowledge from tacit to tacit among members); exteriorization (transmission of knowledge from tacit to explicit or codified); combination (transmission of knowledge from explicit to explicit); and interiorization (transmission of knowledge from explicit to tacit).
[9] This can be seen in the fact that knowledge is expressed essentially as price information.

wrong concepts,[10] i.e. pre-existing knowledge. This process results in personal knowledge that, by interacting with other personal knowledge, can give rise to social knowledge. In addition, if we consider that information may be incomplete, the individual and collective knowledge produced must be not necessarily a univocal outcome.

However, Argyris e Schön (1996) noted that the strategy of a knowledge creation company (or a learning organization), and the related operational mechanisms, are a necessary but not sufficient condition. In fact, any such strategy risks paying lip service to the usefulness of learning unless it takes due account of the implementation difficulties and the problems that originate discrepancies between results and expectations, that is unless the processes that threaten the usefulness and conditions of learning are put into sharp relief. All too often these discrepancies are attributed to action strategies and their underlying assumptions, which players discover and try to correct. The authors define these discrepancies "errors of the first order", while players tend to pay selectively less attention to "errors of the second order", which are attributable to: (i) organizational designs and charts which – it should be borne in mind – affect the interplay between the actions and interactions of individuals, the actions and interactions of higher-level organizational entities (such as departments, divisions, or management groups); (ii) the values of the "theory-in-use", which are generally not explicit but tacit and underlie actions, routines, plans, mental models of a given activity, habits, relationships and collective *modus operandi* that in fact limit learning. A theory-in-use is not a «dataset», but something that is built starting from the observation of the plan of action and any deviation/error. Thus, learning is seen as the identification and correction of an error, with the inquiry starting from the error and turning into the possibility for individuals to change the learning system in which they operate. In other words, learning and inquiry are joined in the close relationship between product and process.

In our opinion, the acquisition and dissemination of these theoretical and practical concepts in management's actions and the diffusion of low-formalization microstructures centred on autopoietic communities of practice - where learning tends to be generated by the intrinsic features of the relevant contexts, more than by complex personal interactions (which are driven in part by learning) - have enhanced the performance of such 'good practices' as arise from situated learning (Lave e Wenger, 1991), thus fostering the shift of training from classrooms and academia to newly-designed workplaces.

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[10] Or also that combination that Polanyi (1958) calls "truth" and "errors" consolidated into a coherent concept system.

3   The role of 'informal' training in new job design

One of the most microfounded approaches intended to acknowledge the impact of organizational design on training is that by Koike (1994). According to this author there are two possible strategies for the division and organization of labour, each defined as separate system and integrated system. The former breaks down operations into two groups: usual operations, for line workers, and unusual operations, involving problem solving, for more experienced workers. Under this organizational design, jobs in the first group require execution capabilities while those in the second call for control (for problem solving activities), command and coordination.[11] The company's job is to upgrade, via training, its workers' skills in accordance with the requirements of the organizational design, a task that takes on an increasing urgency in view of changes in process and/or product technologies undertaken by the firm's top management.

In an integrated system, line operators are required (from the start of their employment, with the temporary help of an expert) to deal with flawed products and the causes of the flaws, as well as to manage changes arising from variations in quantities demanded, modifications of production methods and, finally, the innovation of products. The consequence of repeated problem solving on a daily basis is the development of intellectual (or cognitive) abilities, which are further bolstered by the strategic use of job rotation by a worker,[12] precisely because usual and unusual operations tend to differ from one position to another, determining actual learning and mobility clusters (Dyboswki, 1998). Participation in interfunctional improvement groups (quality circles), suggestion systems and consultation on problems that arise are additional organizational/management techniques that contribute to raise the worker's cognitive and relational abilities, as well as the quality of products and processes, thanks to constant problem solving.

These organizational elements are key features of the so-called HPWOs (*High Performance Work Organization*) (Appelbaum e Batt, 1994; Appelbaum *et al.*, 2000; Ichniowski *et al.* 2000). In addition to organizing their internal activities by process (instead of by function) and delegating

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[11] Under this approach, organizational analysis is called upon to set out the procedures (to eliminate useless steps) and to assign to each job the execution of a specific (and limited) number of procedures. In this way the task is highly specialized and has no relation with its purpose. The transition from tools to machine tools (numerical control machines) and, lastly, to automated machine tools (computerized numerical control machines) brought with it the need to enlarge the tasks of the individual operators, giving rise to the concept and practice of multiple skills (multiskills).

[12] The term strategic should be placed against the backdrop of an organizational design that favours team work, i.e. production islands where workers rotate between upstream and downstream (thus contributing to correct any mistakes made by upstream co-workers thanks to the experience gained) and of the fact that, ideally, permanence in a given job is related to the time necessary to learn the relevant skills.

responsibility (with the resulting flattening of hierarchy levels), HPWOs engage in extensive information dissemination, both to get workers involved and because, according to Nonaka (1994), information is the key ingredient of knowledge formation.

Koike depicts skills as a matrix, whose rows reflect breadth – i.e. the ability of a worker to carry out a series of regular activities (usual operations) – while columns indicate depth – i.e. the worker's intellectual ability to deal with unusual operations.

To produce constantly evolving skills, an organizational design such as that referred to above must fulfil four pre-requirements: (i) involvement of wide arrays of workers (not just an elite), possibly with a good level of basic education, in the aforementioned practices; (ii) skills can be easily acquired by operating within the firm, because they cannot be easily transferred or communicated through language. In addition, skills so acquired are more practical, cheaper and more efficient and effective than would otherwise be the case with traditional off-the-job training; (iii) classroom learning should involve only short courses, with the goal to 'systematize' knowledge acquired on the field, that is to provide the know-why of knowledge (Lundvall e Johnson, 1994); (iv) internal skill development must go hand in hand with career growth (in terms of salary and/or position), both vertically and horizontally, to motivate workers to give their best effort and to foster company loyalty.

In the debate on the mechanisms and determinants of training, the learning hypothesis in question is at the root of the chain of the debated sequences, in accordance with figure 1. This figure reflects learning as theorized by Argyris (1995), Argyris and Schön (1998), and Le Boterf (2000), which concerns the first two types of learning (right-hand side), combining them with organizational learning, which is the subject of this paper. The first type is called single loop learning, as individuals learn by modifying their action on the basis of their own and their organization's objectives. However, there is no substantial change in the objectives or in the values or "action theories" that guide this action: the concept and practice of training are part of this cycle. In double loop learning – the second type - individuals question their objectives and assumptions. They are encouraged to take their operational schemes and concepts to higher levels, that is to revise their "action theories". Training for "open roles" takes place against this background. The third type of learning is related to Wenger's community-of-practice (1998) and to practice as a learning process. Learning is not a separate activity but a result that affects practice; it drives practice. Finally, the fourth type relates to the organizational theory whereby organization and job

designs as well as the methods adopted to motivate workers *translate* into *practices* that shape and develop, in an autopoietic manner, ways to learn skills that result in better performance.

Figure 1 – The learning chain
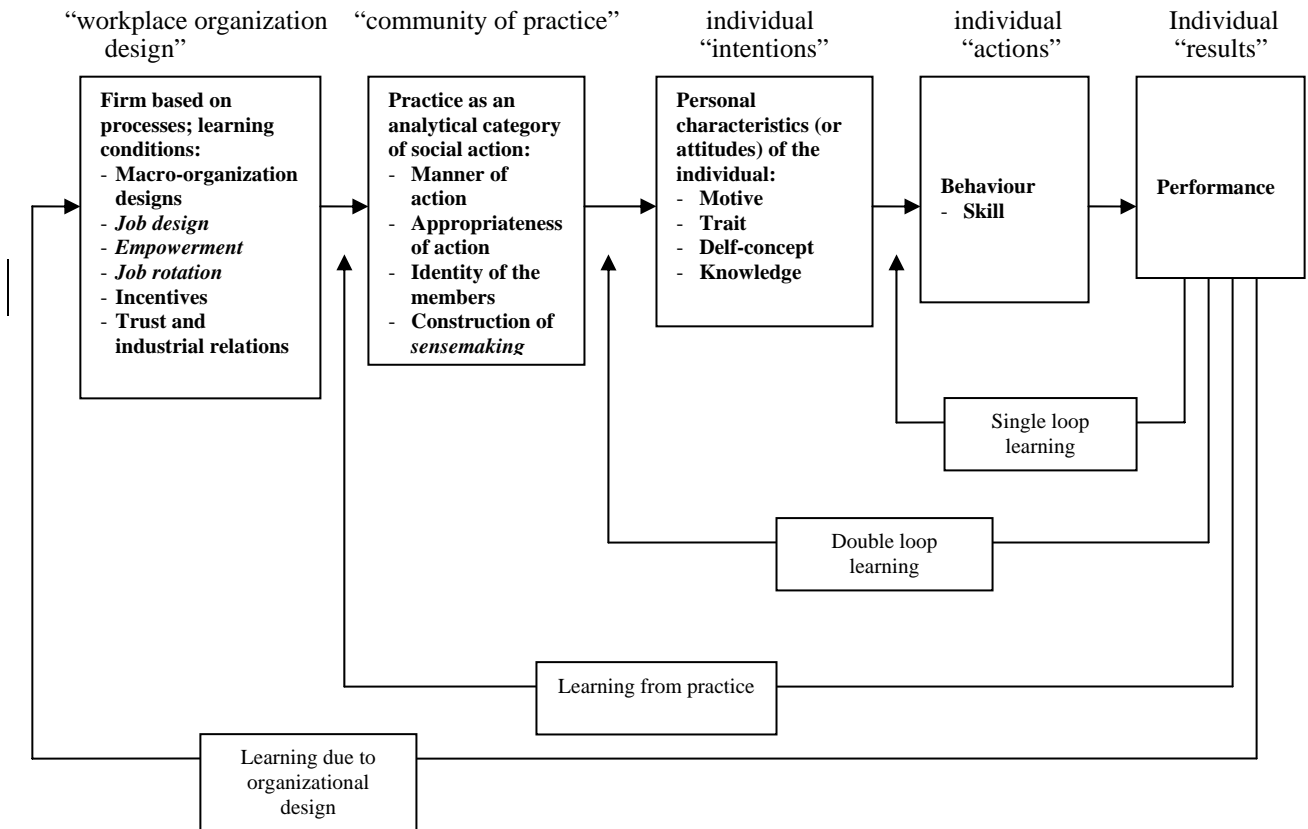
4 Empirical model

The empirical model to be tested is very similar to that by Green *et al.* (2001). It is inspired by the framework of a production function where an individual's skill level is a function of a series of inputs:

$$ICE_{it} = \alpha_1 SCH_{it} + \alpha_2 WBL_{it} + \varepsilon_i + u_{it} \qquad \text{for t = 1, ..n} \qquad [1]$$

where ICE is an index of the skills (competencies) expressed/acted out by the individual in job i, at time t; SCH is an input vector of an educational nature (schooling); WBL is a vector of work-based

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learning indices; ε_i is a fixed level of skills acquired independently of education or work, while u_{it} is a stochastic term with $E(u_{i1} = u_{i2} = \ldots = u_{in} = 0)$.

For education the usual indicator is adopted, that is educational attainment as reflected by the number of school years necessary to obtain the diploma held (SCH: *schooling*), together with the square of such indicator to control for the existence of any decreasing returns, in accordance with the human capital theory.

For work-based learning, the candidate variables are those related to the years of experience in the labour market (WEXP*: work experience*) (these, too, supplemented with the square term); to an interactive term combining educational attainment and work experience (SCH*WEXP); to an index reflecting the learning time required to perform current job duties, as split between two dummies, one active for periods longer than 24 months (HLT: *high learning time*), and the other for periods shorter than 6 months (LLT: *low learning time*); to two dummy indicators to capture whether the individual has been trained by the current employer (TR_CE: *training with current employer*) or by the previous employer (TR_PE: *training with previous employer*); finally, the employee's seniority with the company (TE: *tenure*). In addition to these standard variables, such control indicators are used as: gender (G: *gender*), as estimates from previous surveys suggest that women develop skills more easily, especially in the cognitive dimension (Leoni *et. al.*, 2006, chapter 5); the size of the business (ES: *establishment size*), the growth of which might result in skill improvement thanks to the greater incentives and competition that come with a larger size and/or a more complex organizational design, even though the informality of the roles played in smaller organizations might offset this condition; and, lastly, to two types of non-standard employment contract, i.e. a dummy for fixed-term employment (TC: *temporary contract*), and a dummy for part-time employment (PT: *part-time contracts*), to check whether these types of contract undermine the learning effort of workers and the incentive of companies to train workers.

The variable ε_i reflects such organizational aspects characterizing the individual's job (Z_i) as are deemed to have – according to the literature references in the preceding section – a learning effect, as they prompt the worker to engage in specific work practices. These include: participation in an improvement group (QC: *quality circle*); the submission of suggestions (in the twelve months preceding the interview) to improve efficiency in the individual's work (SS: *suggestion system*); a formal performance evaluation by the immediate supervisor on a systematic basis (APP: *appraisal*); participation in meetings (at least every four months) where supervisors/management provided

information on company operations to check and fine-tune technical and work-definition problems (INF: *information*); and finally participation in meetings (at least once every four months) where, upon request, the individual expressed his or her point of view (CON: *consultation*).

The presence of these variables in the model is due to the idea that the different workplace organizational designs can shape workers' attitudes (and the levels of skills acted out) or – stated differently – that workplaces as such can convey specific attitudes that are independent of the individual's personal inclinations. These attitudes are determined by the practices of a community of workers, where action and knowledge mix and intertwine (Gherardi, 2006, p. 29); where action takes place through the daily interplay of workers that, in a specific workplace, give structure and meaning to the activity; where action includes both the explicit and the tacit (i.e. what is said and what is left unsaid, but assumed) (Wenger, 1998, p. 59).

Specifically:

$$
\begin{aligned}
ICE_{it} = & \ \alpha_0 + \alpha_1 G_{it} + \alpha_2 ES_{it} + \alpha_3 TC_{it} + \alpha_4 PT_{it} \\
& + \alpha_5 SCH_{it} + \alpha_6 SCH_{it}^2 + \alpha_7 WEXP_{it} + \alpha_8 WEXP_{it}^2 + \alpha_9 SCH_{it} * WEXP_{it} \\
& + \alpha_{10} HLT_{it} + \alpha_{11} LLT_{it} + \alpha_{12} TR\_CE_{it} + \alpha_{13} TR\_PE_{it} + \alpha_{14} TE \\
& + \alpha_{15} QC_{it} + \alpha_{16} SS_{it} + \alpha_{17} APP_{it} + \alpha_{18} INF_{it} + \alpha_{19} CONS_{it}
\end{aligned}
$$

[2]

The above hypotheses are expected to result in the following signs:

$$
\begin{aligned}
& \alpha_{1,F} > 0, \ \alpha_2 \geq \leq 0, \ \alpha_3 < 0, \ \alpha_4 < 0, \\
& \alpha_5 > 0, \ \alpha_6 < 0, \ \alpha_7 > 0, \ \alpha_8 < 0, \ \alpha_9 > 0 \\
& \alpha_{10} > 0, \ \alpha_{11} < 0, \ \alpha_{12} > 0, \ \alpha_{13} = 0, \ + \alpha_{14} > 0 \\
& \alpha_{15} > 0, \ \alpha_{16} > 0, \ \alpha_{17} > 0, \ \alpha_{18} > 0, \ \alpha_{19} > 0
\end{aligned}
$$

5 The database and estimate problems

The database[13] utilized to test the above model was constructed by ISFOL, following a survey carried out through a questionnaire administered via CAPI to a stratified sample of approximately 3605 salaried workers, representing 9.2 million private sector workers (excluding workers in the

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[13] The database and the relevant questionnaire can be downloaded from the web site www.oac-insfol.it.

construction and agricultural sectors).[14] The questionnaire contains a section intended to determine the frequency of organizational attitudes successfully practiced by the respondents, with detailed references to the 'organized context' where the individual operates, and distinctions among: (i) skills required by the role, (ii) expertise held (i.e. mastery in performing, in given contexts, specific activities), and (iii) organizational behaviours really activated.

5.1 Dependent variable

There are 44 listed activities. They are surveyed through a Likert scale from 1 to 7, with frequencies rising from 'rarely' to 'practically nearly always', to determine whether the attitudes required by the position filled are activated effectively. The items represent organizational attitudes that combine to constitute various skill dimensions. Following the line of thinking of "Skills in Britain" (Ashton *et. al.*, 1999), these dimensions consist of components expressed in such realms as: (i) cognitive/intellectual (writing, reading, calculation, problem solving, control, planning); (ii) interpersonal (communication, teamwork, supervision); (iii) physical (effort, endurance, manual ability); (iv) knowledge (technical, specialized, IT); (v) motivation/self-startedness (reliability, motivation, ability to take independent action); (vi) attitudes/work conditions (organizational effort, autonomy, discretionality, responsibility, variety).

This approach is founded on the idea (as argued by Green *et al.*, 2001) that workers know much more than what it appears from what they actually do and are required to do on the job. As a result, they are capable of providing a truthful assessment of the activities performed and how they perform them. In a similar vein, workers are capable of self-assessing their own skills. If there is a self-appraisal error (either overestimation or underestimation), this is simply assumed to be unrelated to the other variables.

The value of a worker's self-appraisal of the activities required and performed, as opposed to the traditional job descriptions by organizational analysis experts, was supported by the international literature (Kulik *et al.*, 1987; Fried e Ferris, 1987; Spenner, 1990), documenting instances where it was found that workers' assessments were substantially similar to those made by external observers/specialists. This literature suggests also that the (not easily identifiable and measurable) distortion risk arising from 'social desirability'- which may lead individuals to overestimate their self-assessed skills - can be curbed to a significant extent by paying attention to the language used in questionnaires, by asking *respondents not for an assessment of the skills*

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[14] For the methodological approach of the survey and for an initial assessment of the results, see Tomassini, 2006.

possessed but the degree of role coverage. This can be measured by the frequency with which the required duties are fulfilled effectively by respondents. The result is a survey of the skills actually employed (because they are required by the position), which reflect in the respondent's attitudes and performance. As argued elsewhere (Leoni, 2006b, p.79; but also Ashton *et al.*, 1999), one way to proceed with interviews to workers is to inquire about *<problem solving >*: a question may be structured in such a way as to prompt a response showing the ability *<to solve problems>* or an attitude, such as *<I solve problems>*. While the latter tends to determine what the individual does in practice, the former may be interpreted as a potential or ability to know how to do something. The adoption of this principle is not without risk and fault. This because workers might have, on one side, more skills than required, perhaps activating organizational attitudes that fulfil required duties in whole or even in part (for a variety of reasons); on the other side, they might have insufficient skills, reporting as a result that they fulfil the required duties in part. However, there might be skills possessed but not required at all. Likewise, it cannot be ruled out that negative gaps might be the result of shirking or opportunism. All these problems may be offset by the benefit arising from the respondents' tendency to limit ambiguity and their social desirability.

Factor analysis, as applied to respondent data, made it possible to highlight as common factors a number of skills, as well as an index of total skills (Leoni, 2006b, and methodological appendix downloadable from the web site indicated in footnote 14). Subsequently, based on contributions coming from economics, sociology and psychology – a series of "key competencies", called also transversal competencies or skills (reference to which is made in this paper), was identified as the expression of such activities as: (i) problem solving (carried out through the in-depth analysis of complex problems, the solution of problems, the identification of errors, and thinking about solving problems); (ii) communication/social interaction with two different groups of counterparties: (ii.a) customers (for instance, providing advice and customer care, or by selling a product or service), (ii.b) subordinates (for instance managing effectively subordinates, or giving instructions or training subordinates); and finally (iii) teamwork (joining in a team effort, helping other team members, listening carefully to colleagues). Moreover, an overall skill index was compiled, by weighing the individual indices, through the variances explained by the individual factors extracted with the factor analysis.

These competencies can be defined as "transversal skills", as theorized by the ISFOL working group (1994) and subsequently adopted – and qualified as "key" - also by the OECD in the DeSeCo (*Definition and Selection of Competencies*) project of 1997 (cf. Ryken e Salganik, 2003, pp. 66-67).

These skills transcend and cross the borders of the various disciplines (which are the subject of specialized activities). They can be activated in different positions and supplement specialist skills. Transversal skills, which can be defined also by using the adjective strategic, are associated with the epistemological concept of metacompetencies (Montedoro, 2004, p. 49), constituting a 'class' of a higher logic order vis-à-vis specialist competencies. According to Alberici (2004, p. 106), metacompetencies are related to that dimension of human action related to the *reflectiveness* of thought and the autopoietic nature of competency. These metacompetencies unfold in such dimensions as personal psychological and social resources, social skills and, finally, organizational skills, which include the constructs underlying the factors extracted with the factor analysis.

In this paper reference is made to these dimensions of the competencies expressed (or acted out) by applying equation [2] to the overall index and to each of the competencies identified. Table 1 shows the average value of each of the competency indices expressed, with reference to various conditions of the worker. The emerging indications seem to go, in general, in the expected direction. However, for proper analysis of the data in the table, it should be noted that – by construction - *data are comparable only in the column*, as the 'common factors' are fed by a different number of items (and coefficients), which affects the level of the calculated index. To illustrate and compare the individual competencies, data standardization procedures might be applied. However, since the objective of this paper is to explain the underlying causation factors, such a procedure would be redundant.

< table 1 approximately here >

5.2 Independent variables

Every respondent was asked several questions, many of which cover quite accurately the specifications of the explanatory variables described in section 4. The only specification to be added concerns the length of time necessary to learn the skills expressed by the worker. In this paper, we select arbitrarily (though in accordance with Green *et al.,* 2001) three intervals, that is less than 6 months (*low learning time*), between 6 months and 24 months (default variable) and over 24 months (*high learning time*).

But respondents were asked also retrospective questions, concerning the organizational condition of their job 5 years earlier, i.e. participation in quality circles and formal and periodic

evaluation of their performance. Moreover, respondents were asked to indicate whether their discretionary power on the job had increased or decreased, compared with the previous condition.

Table 2 shows the statistical characteristics of the variables utilized in the estimation processes.

< table 2 approximately here >

Skills are expressed by the absolute scores obtained from the factor analysis, while education, work experience and tenure are measured in terms of years. The dichotomic variables reflect the condition measured in percentage terms: for instance, the percentage of workers reporting a period longer than 24 months to learn their skills was 17 percent, compared with 59 percent for those reporting a period of less than 6 months (with the percentage necessary to reach 100 percent being captured by default by the equation constant).

The sample utilized (for the target universe) consisted of 3578 individuals. This number fell to 3224 due to lack of replies to the question on participation in quality circles five years prior to the interview. It is natural that the average values of some of the variables in both samples differ, as the second sample does not include workers (especially younger workers and women who just re-entered the workforce) that at time t-5 were not employed. Compared to the second, the first sample is relatively 'younger' and, accordingly, variables that reflect seniority (such as: work experience, tenure, but also cumulative skills or temporary employment contracts, which are more typical at the beginning of a career and, as such, concern younger people) have a higher or lower average value, depending on the case.

The t-test performed on the single variables (table 2) confirmed substantially that the second sample was 'randomly extracted' from the first, except for those variables discussed above.

6 Findings

Table 3 shows the estimates of model [2], which is related to the overall key competencies expressed by the worker. In column 1, the model is restricted to some control variables and schooling, in keeping with the suggestions of the theory of human capital. The estimates provide an indication in line with this theory, that is the marginal return on education for the skill level appears to be positively decreasing. Among control variables, the negative condition for women as well as for fixed-tem and part-time employees is strongly emphasized. But, the result is not robust, and the

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return on education appears to rise steadily following the inclusion of the years of experience in the labour market (mod_2), a variable which is not statistically significant.

< table 3 approximately here >

The introduction of the variables related to *work-based learning* (mod_3) brings into sharp relief their explanatory power. The longer (the shorter) the time required to learn them, the higher (the lower) the level of skills acquired and expressed by individuals throughout their career. Training and company seniority are two significant factors for the individual's skill development.

However, the key variables in the model (mod_4) are those that reflect the organizational characteristics of the jobs, which are strictly in line with the theory set out in section 3 on HPWOs, as well as with the results of Green *et al.* (2001). The peculiarity of these variables is that they are complementary with those related to work-based learning, simultaneously reducing the role of schooling (whose p-value rises to the limit of acceptability: 9%) and training received from the previous employer. The non-significance of the coefficient of this last variable upholds the idea that companies tend to provide firm-specific training, which the worker cannot utilize in a different context.

< table 4 approximately here >

As already noted, the database provides two retrospective bits of information concerning the respondent's organizational condition five years earlier – i.e. participation, or absence thereof, in quality circles or improvement groups, and periodic evaluation, or absence thereof, of work performance. Moreover, compared to the work conditions prevailing five years earlier, it could be determined whether the worker's discretionary power had increased or diminished and whether employment had become permanent, on a full-time basis. In this case the sample shrank to 3224. Before proceeding with the evaluation of the role of the new variables, mod_4 (in table 3) was re-estimated to check whether the difference in the sample number had entailed changes in the results obtained. Basically, mod_4 (table 3) confirmed the previous results, except for the significance of the schooling and information coefficients, which fell to values that were no longer statistically acceptable.

Mod_5 applied to the single key competencies (tables 4-8) shows results in line with those obtained for overall competencies, with some exceptions. For instance, the variable related to schooling returns to its role in connection with skills related to problem solving and communication/relationships with subordinates, while the variable on information loses (gains) significance in the first (second) of the two competencies in question.

< tables 5,6,7,8 approximately here >

When the 5-year lag variables are introduced in the model (mod_5, tables 5-8), the results are substantially similar to the previous ones, with two significant qualifications.

The first concerns the condition of participation in quality circles, where importance is attributed not to continued permanence but to variety. The mission of these circles is short-lived. These groups, which are also called improvement groups, are generally intended to address and solve one or more common problems, to develop new ideas/products, or simply to brainstorm. Long and engaging personal interactions create new knowledge and skills, according to what Nonaka e Takeuchi (1995, p.170) call "socialization" (transmission of knowledge from tacit to tacit among members) and "exteriorization" (transmission of knowledge from tacit to explicit or codified) mechanisms.

The second qualification concerns the condition of performance evaluation, confirming the role as a skill development mechanism of a systematic, non-occasional process in this area. These interviews (which may have been structured differently, though no investigation was conducted in this respect by the survey) generally address both competencies, with a review of the weaknesses that the individual should try to correct, [15] and incentives. The interview mechanism, and its continuity over time, helps individuals to direct their efforts toward the attainment of the skills required by the organization.

The positive effect of performance evaluation interviews for skill development purposes was found also by Diaye *et al.* (2007) in French manufacturing companies with over 50 employees.

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[15] This effort is aided by the evaluator (who generally is the employee's supervisor) as well as by the company's "training" department.

7 Correlation or causations? The econometric problems of endogeneity, selection bias and heterogeneity

There are three problems of an econometric nature that can be raised in connection with the estimates completed: the endogeneity of some variables, the selection bias associated with the individuals sampled and heterogeneity (heteroskedasticity).

In terms of the first problem, one of the main concerns in validating somehow results obtained with cross-section estimation techniques is reverse causality, that is some variables could be of an endogenous nature. The sources of this problem might be two.

One involves organizational variables, as it might be argued that these are not as instrumental – through the practices that they cause workers to perform – in improving the skills of the individual as the personality traits of the workers employed by the organization. These traits, which are often largely neglected, are specific to the individual and constant over time. As suggested by Ferrer-i-Carbonell and Frijters (2004), these types of variable would be the ideal candidates to capture *<individual fixed effects>*, thus making it possible to control for such effects on the variables suspected of endogeneity.

The variables related to personality traits available in the database, which could serve the purpose, are four. Three could be structured in terms of agreement or disagreement (as measured on a seven-level Likert scale, where the lowest level reflects "total disagreement" and the highest "complete agreement) with the following expressions:

i) I am proud to do best job I can (question D.8_2);

ii) I am resolved/determined to do my job well (question D.8_3);

iii) I identify with the company's values (question D.4_3);

The fourth is a combination of two questions on the need (in terms of the position filled) to undergo constant and periodic training (question B.9), with the individual pursuing further education on his or her own by keeping up with books and magazines (question B.9_3).

< table 9 approximately here >

Table 9 shows the estimate results. This shows that two out of the four control variables for personality traits (specifically, the third and fourth) appear to be statistically significant, as they play a positive role for personal skills. This, however, does not detract from organizational

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characteristics, even though the value of some of their coefficients change. The most frequent case is that of "employee suggestions", whose coefficient falls in all the equations (with respect to the values in tables 5-8). However, this coefficient is always statistically significant, bearing out the idea that the formal introduction of such a mechanism into the organization, complete with financial rewards, contributes to encourage employees to make greater efforts and, indirectly, to improve their skills, thanks to the repeated drill involved in the analysis and presentation of solutions to existing problems in the activities performed.

The mechanisms underlying our organizational variables work in a similar fashion.[16]

The second possible source of endogeneity is the variable related to company seniority (tenure). In the debate on the wage equation, this variable is considered endogenous. The same problem crops up also in our case, in the sense that it might be argued that more skilled workers have been employed longer by the firm. In this case, more than capturing the components of work-based learning, tenure might reflect the total of all the skills acquired. The problem can be dealt with through the use of a two-stage estimation procedure (TSLS), subject to the availability of proper tools. To this end, the database has five variables that can serve the purpose, in the form of the following questions:

a) I am willing to work harder to help this company succeed (question D.4_1);

b) I don't think I am very loyal to this company (question D.4_2);

c) I identify with the company's values (question D.4_3);

d) I am proud to work for this company (question D.4_5);

e) I am ready to do anything to stay with this company (question D.4_6).

The questions are structured in terms of agreement or disagreement, as measured on a seven-level Likert scale, where the lowest level reflects "total disagreement" and the highest "complete agreement".

Table 10 shows the results, from which it emerges that the variable in question (tenure) no longer explains the level of skills in general, contrary to the theories of work-based learning, learning-by-doing, learning-by-using, learning-by-interacting and learning-by-searching. The only exception is communications with clients, where experience continues to be an "additional" source

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[16] Actually, Hausman's test was performed on model 7 in table 9. For two of the variables related to organizational characteristics (specifically, participation in quality circles and a formal and systematic performance evaluation process) there is the same information delayed to time t-5, which was used as a tool to test the endogeneity of the two variables in question. For all five equations in model 7, table 9, the test rejected by far the endogeneity hypothesis: in fact, the Chi2 probability is around 0.99 for all five cases. On the other hand, since the result of the test must be consistent with the tools utilized, the alternative method shown in the text was adopted.

of self-development for this skill. However, except for this last case, it appears that action as such is no longer a significant source of learning. More than continuous repetition, what counts is an organizational context that encourages the individual to diagnose and solve problems in all areas (including customer and subordinate relations).

All the other coefficients are basically unchanged, as are the relevant considerations outlined above.

As to the second problem (selection bias), this can be raised with respect to schooling, in the sense that – as acknowledged also by Green *et al.* (2001, p. 415) – what is estimated is the impact of schooling on the level of skills, provided that the individuals are employed, while no consideration is given to the impact of schooling on the probability of being employed. In addition, there might be a further selection bias problem, as being employed (thus being in the sample) might depend on a number of requirements not fulfilled by the individuals. To this end, we can only agree with our British authors (*ibidem*), when they state that "*the problem is common to thousands of conventional earning functions estimations, and selection bias is typically assumed to be not unacceptably high in such case. Nevertheless, such qualification should be remembered*".

As to the third problem (heterogeneity, or homoskedasticity vs. heteroskedasticity in the structure of the residuals), all the estimates completed used White's robust standard error, correcting all conventional standard errors to take into account any heteroskedasticity in the residuals. A graphic inspection of the residuals of all the equations estimated in table 10, with a cross-section in terms of size of the firm (possible variable generating the problem), does not reveal any additional heteroskedasticity elements.[17]

8 **Policy implications**

The findings of this research highlight the role of organizational design in shaping and developing the individual worker's skills. Considering also the results of other analyses – especially those whereby lean organizations: (a) deliver better performance,[18] (b) spur greater radical and incremental product innovation,[19] and (c) are conducive to greater worker satisfaction and

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[17] The graphics are not shown to save space. However, they are available upon request.
[18] For further information reference should be made to the growing literature on this aspect: Ichniowski *et al.*, 1997; Black and Lynch (2001, 2004), Brynjolfsson and Hitt, 2000; Caroli and Van Reenen, 2001; Brynjolfsson *et al.*, 2002; Brynjolfsson and Hitt, 2003; Bauer, 2003; Cristini et. al., 2003; Zwick , 2004.
[19] See Michie and Sheehan, 1999, 2003; Pini and Santangelo (2005a, 2005b).

commitment[20] - it is our opinion that a much closer look should be taken at the notion of the inevitability of the alienating fragmentation of work, which is dictated by the interest of firms in outsourcing the manufacture of components throughout the world and assembling the final product in one place. We think that the theory whereby individuals are strongly defined by what they do for a living should be rediscovered, emphasized, but also qualified. This means that "work" (within the meaning of the term attributed to Arendt) is the foundation of personal identity and meaning of individual lives, provided that workplaces have the appropriate characteristics, such as those identified by the strand of research on HPWOs, to which our, Green *et al*. (2001) and Bartel *et al*. (2004) findings refer.

These findings are important also in connection with two significant policy questions:

1. the positive identification of the key characteristics of workplaces that foster skill development should prompt the employees and employers to introduce – through company agreements – policies designed to develop and redesign workplaces, to achieve objectives in keeping with the findings of this, Green *et al*. (2001) and Bartel *et al*. (2004) research;

2. the adoption by firms of the workplace reorganization processes necessary to achieve objectives in line with the above findings should be encouraged by national policies intended to create the conditions for an effective development and redesign of the workplaces, in accordance with the models of the companies investigated for this paper. Besides, these policies have already been implemented in many countries of Northern Europe, following publication of the green book by the EU in 1997 on "Partnership for a new organisation of work." [21]

An economic and industrial policy designed to encourage the organizational development of workplaces, in keeping with the above characteristics, would make it possible also to generate dynamic capabilities (Teece, Pisano e Shuen, 1997; Cristini *et al.*, 2005) thanks to the virtuous circle that sets in, despite the contrasting effects of the constant changes in the demand for products and services. In other words, such a policy would encourage recurrence in the creation of capabilities along a circular flow from organizational design/human resources management, to informal learning processes, to skill development and back again to organizational design/human resources management, and so on. Since it is self-sustaining, this process makes learning genuinely "organizational" more than "individual". If this circularity were to be further confirmed, it would follow that companies are limited in and by their capabilities to change their growth path. From a

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[20] See Freeman and Kleiner, 2000; Helliwell and Huang, 2005; Origo and Pagani, 2006; Cristini, 2007.
[21] For a review of these policies, see: Business Decisions Limited, 2000; Alasoini et al., 2005

theoretical point of view, these path-dependency effects can, on the one hand, help to understand the persistent heterogeneity of firms and, on the other, act as predictors of future capability accumulation processes. However, in the meantime, these effects make available to policymakers information on possible starting points for action against lock-in factors and/or the slowdown of growth in organizational learning and the performance of firms.

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Table 1 – Key competence by personal characteristics, occupation, contracts, establishment size, sector and geographical area.

Characteristics	Level of key competences*				
	Problem solving	Communication with clients	Communication with collaborators	Team working	Total key competences
Mean	8.5	5.6	2.9	6.2	19.1
- min-max	0-16.9	0-18.8	0-13.3	0-13.2	0-46.5
- s.d.	4.5	4.9	3.1	3.7	9.8
personal characteristics					
Gender					
Men	9.1	5.5	3.1	6.6	20.1
Women	7.7	5.8	2.5	5.6	17.6
Age groups					
15-29	7.9	5.4	2.2	5.9	17.8
30-44	8.7	5.7	3.1	6.3	19.6
45-64	8.6	5.7	3.3	6.3	19.6
Schooling					
Compulsory school	6.6	3.7	1.9	5.8	15.3
Compulsory school + vocational training	8.2	5.3	2.9	6.0	18.4
High school diploma	9.6	6.7	3.3	6.5	21.2
Degree	11.0	8.1	4.6	6.9	24.4
Post-graduate degree	12.8	10.3	7.3	8.8	30.5
Professional position/professional occupation					
Professional position					
Blue-collar worker	7.2	4.2	2.1	5.9	16.4
White-collar worker	9.9	7.2	3.6	6.2	21.6
Manager/ Professional and Managerial Staff	12.2	9.3	6.1	8.5	28.6
Professional occupation					
Other Occupations	5.9	3.9	1.7	5.4	14.2
Plants & Machine Operative	6.7	2.8	1.6	5.8	14.7
Sales Occupations	7.7	10.8	3.6	5.4	20.8
Personal & Protective Service	9.4	9.5	3.8	6.2	22.6
Craft & Related	9.0	9.5	3.8	6.8	19.0

Occupations					
Clerical & Secretarial Occupations	9.9	7.0	3.5	6.2	**21.6**
Associated professionals & technicians	11.2	8.6	4.9	7.3	**25.4**
Professional	12.6	6.9	4.9	8.4	**27.0**
Manager	12.8	10.2	7.2	9.3	**30.9**
Type of contract					
Fixed-term	7.0	5.3	1.8	5.8	**16.5**
Open-end	8.7	8.7	3.0	6.2	**19.4**
Part-time	6.7	5.5	2.2	5.2	**15.9**
Full-time	8.8	5.6	3.0	6.4	**19.6**
Size/sectors/area					
Establishment Size					
1-3	8.2	6.6	2.5	4.7	**17.6**
4-9	8.7	6.4	3.1	6.5	**20.2**
10-15	8.5	5.7	3.1	5.7	**18.7**
16-49	8.5	5.0	2.9	5.7	**18.7**
50-99	8.7	4.9	3.0	6.6	**19.3**
100-499	8.8	4.9	2.9	7.3	**20.0**
500-ω	8.5	8.5	4.9	7.2	**19.7**
Sectors					
Manufacturing	8.3	3.8	2.4	6.2	**17.7**
- traditionals	7.7	3.6	2.1	5.7	**16.3**
- scale intensive	8.7	3.8	2.5	6.5	**18.3**
- science based	8.4	4.0	2.7	6.8	**18.6**
Commerce	8.6	8.0	3.4	6.3	**20.9**
Hotel + restaurant	6.3	6.0	2.2	5.0	**15.6**
Transport + warehousing	7.9	4.7	2.3	5.5	**17.0**
Communication +ICT	10.0	6.5	3.6	6.7	**21.9**
Banks + Financial Intermediaries	10.7	10.4	4.9	7.6	**26.3**
Other activities	8.7	5.6	3.2	5.9	**19.1**
Geographical Area					
North-West	8.7	5.2	2.8	6.3	**19.2**
North-East	8.9	5.7	3.1	6.4	**19.9**
Centre	8.3	5.9	2.7	5.8	**18.6**
South + Islands	8.7	5.9	3.0	5.9	**19.1**

* By construction, level of competences can be compared only along the columns, and not along the rows.

Table 2 – Descriptive statistics of the two samples

	Full sample, of 3578,[+] representative of 9.036.677 employees		Riduced sample, of 3224,[++] representative of 7.936.190 employees		Min [+++]	Max [+++]	t-test on the differences of means
	Mean (weighted)	s.d.	Mean (weighted)	s.d.			
Total key competence (ICE$_T$)	19,21	9,79	19.54	9,88	0	46,49	0,167
Competence: problem solving	8,55	4,57	8,64	4,60	0	16,97	0,419
Competence: communications with clients	5,66	4,86	5,75	4,87	0	18,82	0.446
Competence: communication with collaborators	2,94	3,11	3,07	3,15	0	13,31	0.087 *
Competence: team working	6,22	3,73	6,34	3,75	0	13,17	0,186
Gender: 1-M (2-F)	1,38	0,49	1,36	0,48	1	2	0,089 *
Establishment size	87,94	512,35	95,07	534,34	1	18000	0,574
Temporary contract	0,084	0,28	0,056	0,23	0	1	0,000 ***
Part time contract	0,118	0,32	0,109	0,31	0	1	0,240
Schooling (years)	12,19	3,54	12,16	3,53	5	22	0,727
Work experience (years)	15,44	10,38	17,00	9,83	1	50	0,727
High learning time (> 24 months)	0,17	0,37	0,18	0,39	0	1	0,278
Low learning time (< 6 months)	0,59	0,49	0,56	0,50	0	1	0,012 **
Training with current employer	0,29	0,46	0,31	0,46	0	1	0,073 *
Training with previous employer	0,12	0,32	0,12	0,32	0	1	0.959
Tenure (years)	9,59	8,55	10,56	8,57	0	44	0.000 ***
Quality circle	0,08	0,27	0,08	0,28	0	1	0,967
Suggestion system	0,63	0,48	0,66	0,47	0	1	0,009 ***
Appraisal	0,22	0,42	0,23	0,42	0	1	0,327
Information	0,01	0,11	0,01	0,11	0	1	0,984
Consultation	0,43	0,50	0,45	0,50	0	1	0.101

[+] Full sample, equal to 3605 employees, has been reduced of 27 units due to lack of replies to the variable concerning establishment size.

[++] Sample has been reduce due to lack of replies to the question I.10 of the questionnaire, on participation in quality circles five years prior to the interview.

[+++] Min and Max values are identical between the two samples.

Level of confidence on the difference of means: *** = 1%, ** = 5% e * = 10%.

Table 3 - Dependent variable: index of total key competences

Weighted OLS estimates, with heterosckedasticity-robust standard error. Levels of confidence: *** = 1%, ** = 5%, * = 10%

Indip. variables	Mod_1		Mod_2		Mod_3		Mod_4	
	Coeff (s.e.)	l.o.c.	Coeff (s.e.)	l.o.c.	Coeff (s.e.)	l.o.c.	Coeff (s.e.)	l.o.c.
Gender: 1-M (2-F)	-2.220 (.582)	***	-1.905 (.581)	***	-1.211 (.536)	**	-0.601 (.515)	
Establishment size	0.00003 (.0002)		-0.0004 (.0002)		-0.00006 (.0003)		-0.0002 (.0003)	
Temporary contract	-1.968 (.920)	**	-1.059 (.890)		-0.461 (.882)		0.058 (.851)	
Part time contract	-1.642 (.777)	**	-1.608 (.772)	**	-0.905 (.732)		-1.227 (.690)	*
Schooling	1.673 (.409)	***	1.327 (.476)	***	1.022 (.463)	**	0.769 (.450)	*
Schooling^2	-0.029 (.016)	*	-0.018 (.017)		-0.013 (.017)		-0.011 (.016)	
Work experience (WEXP)			0.084 (.114)		-0.057 (.108)		-0.129 (.109)	
WEXP^2			-0.002 (.002)		0.001 (.002)		0.001 (.002)	
Schooling*WEXP			0.014 (.010)		0.007 (.010)		0.011 (.009)	
High learning time (> 24 months)					2.121 (.978)	**	1.558 (.953)	*
Low learning time (< 6 months)					-2.693 (.602)	***	-1.629 (.601)	***
Training with current employer					4.222 (.678)	***	1.965 (.703)	***
Training with previous employer					2.547 (.865)	***	1.253 (.852)	
Tenure					0.073 (.038)	*	0.090 (.037)	***
Quality circle							2.690 (.933)	***
Suggestion system							4.275 (.548)	***
Appraisal							2.109 (.680)	***
Information							2.171 (1.119)	**
Consultation							2.352 (3.116)	***
Constant	7.691 (2.588)	***	7.519 (3.166)	**	10.239 (3.182)	***	8.160 (3.116)	***
Number of obs	3578		3578		3578		3578	
F(19, 3558)	32.02		31.09		30.78		38.18	
Prob > F	0.0000		0.0000		0.0000		0.0000	
R-squared	0.1237		0.1380		0.2203		0.3094	
Root MSE	9.1781		9.1069		8.6676		8.1629	

Table 4 - Dependent variable: index of competence 'TOTAL KEY COMPETENCES'

Weighted OLS estimates, with heteroschedasticity-robust standard error. Levels of confidence: *** = 1%, ** = 5%, * = 10%

Indip. variables	Model_5 Coefficients (s.e.)	l.o.c.	Model_6 Coefficients (s.e.)	l.o.c.
Gender: 1-M (2-F)	-0.558 (.563)		-0.525 (.563)	
Establishment size	-0.0002 (.0003)		-0.0003 (.0003)	
Temporary contract (time t)	0.753 (.964)		0.857 (.994)	
Change contract: from temporary (t-5) to permanent (t)			0.446 (.924)	
Part time contract (time t)	-1.806 (.755)	**	-1.785 (.766)	**
Change contract: from part-time (t-5) to full-time (t)			0.318 (1.154)	
Schooling	0.638 (.527)		0.669 (.543)	
Schooling^2	-0.003 (.018)		-0.005 (.019)	
Work experience (WEXP)	-0.124 (.134)		-0.106 (.135)	
WEXP^2	0.001 (.003)		0.001 (.003)	
Schooling*WEXP	0.001 (.010)		0.010 (.011)	
High learning time (> 24 months)	1.654 (.983)	*	1.520 (.960)	
Low learning time (< 6 months)	-1.587 (.637)	***	-1.592 (.635)	***
Training with current employer	1.946 (.746)	***	1.919 (.775)	***
Training with previous employer	0.864 (.921)		0.816 (.914)	
Tenure	0.090 (.037)	**	0.092 (.038)	***
Quality circle (time t)	2.495 (.993)	***		
Quality circle (yes, time t & t-5)			0.946 (1.482)	
Quality circle (yes time t; no t-5)			3.916 (1.082)	***
Suggestion system	4.612 (.588)	***	4.480 (.587)	***
Appraisal (time t)	1.991 (.730)	***		
Appraisal (yes, time t & t-5)			2.125 (.890)	**
Appraisal (yes time t; no t-5)			1.508 (1.131)	
Information	1.441		1.243	

	(1.177)		(1.186)	
Consultation	2.372 (.697)	***	2.326 (.710)	***
Increase in discretionary power *(between t-5 and t)*			1.263 (.728)	*
constant	8.346 (3.686)	**	7.824 (.3773)	**
Number of obs.	3224		3224	
F (19, 3204)	38.33		32.35	
Prob > F	0.0000		0.0000	
R-squared	0.3211		0.3262	
Root MSE	8.1632		8.1389	

Table 5 - Dependent variable: index of competence 'PROBLEM SOLVING'

Weighted OLS estimates, with heterosckedasticity-robust standard error. Levels of confidence: *** = 1%, ** = 5%, * = 10%

	Model_5		Model_6	
Indip. variables	**Coefficients** **(s.e.)**	**l.o.c.**	**Coefficients** **(s.e.)**	**l.o.c.**
Gender: 1-M (2-F)	-0.650 (.291)	**	-0.637 (.290)	**
Establishment size	-0.00013 (.0001)		-0.00015 (.0001)	
Temporary contract (time t)	0.232 (.503)		0.294 (.520)	
Change contract: from temporary (t-5) *to permanent (t)*			0.435 (.534)	
Part time contract (time t)	-1.086 (.388)	***	-1.082 (.392)	***
Change contract: from part-time (t-5) *to full-time (t)*			0.212 (.530)	
Schooling	0.851 (.313)	***	0.860 (.323)	***
Schooling^2	-0.019 (.010)	*	-0.020 (.010)	**
Work experience (WEXP)	0.009 (.076)		0.022 (.077)	
WEXP^2	0.0002 (.001)		-0.0008 (.014)	
Schooling*WEXP	-0.002 (.006)		-0.002 (.006)	
High learning time (> 24 months)	0.687 (.463)		0.627 (.449)	
Low learning time (< 6 months)	-0.790 (.310)	***	-0.790 (.311)	***
Training with current employer	0.786 (.371)	**	0.781 (.382)	**
Training with previous employer	0.656 (.484)		0.628 (.480)	
Tenure	0.042	**	0.044	***

Indip. variables	Coefficients (s.e.)	l.o.c.	Coefficients (s.e.)	l.o.c.
	(.018)		(.018)	
Quality circle (time t)	1.386 (.422)	***		
Quality circle (yes, time t & t-5)			0.804 (.571)	
Quality circle (yes time t; no t-5)			1.919 (.521)	***
Suggestion system	1.561 (.318)	***	1.497 (.318)	***
Appraisal (time t)	0.134 (.358)			
Appraisal (yes, time t & t-5)			0.112 (.463)	
Appraisal (yes time t; no t-5)			0.038 (.461)	
Information	0.048 (.536)		-0.013 (.550)	
Consultation	0.825 (.348)	**	0.800 (.353)	**
Increase in discretionary power (between t-5 and t)			0.620 (.361)	*
constant	0.656 (2.286)		0.384 (2.358)	
Number of obs.	3224		3224	
F (19, 3204)	26.73		21.87	
Prob > F	0.0000		0.0000	
R-squared	0.2658		0.2709	
Root MSE	3.9547		3.944	

Table 6 - Dependent variable: index of competence 'COMMUNICATION WITH CLIENTS'

Weighted OLS estimates, with heteroskedasticity-robust standard error. Levels of confidence: *** = 1%, ** = 5%, * = 10%

	Mod_5		**Mod_6**	
Indip. variables	**Coefficients (s.e.)**	**l.o.c.**	**Coefficients (s.e.)**	**l.o.c.**
Gender: 1-M (2-F)	0.862 (.275)	***	0.882 (.272)	***
Establishment size	-0.0005 (.0002)	**	-0.0005 (.0002)	**
Temporary contract (time t)	0.262 (.501)		0.168 (.516)	
Change contract: from temporary (t-5) to permanent (t)			-1.054 (.472)	**
Part time contract (time t)	-0.256 (.414)		-0.200 (.416)	
Change contract: from part-time (t-5) to full-time (t)			0.062 (.633)	
Schooling	0.115 (.276)		0.169 (.264)	
Schooling^2	0.004		0.002	

	(.009)		(.009)	
Work experience (WEXP)	-0.150 (.070)	**	-0.161 (.070)	**
WEXP^2	0.002 (.001)		0.002 (.001)	
Schooling*WEXP	0.012 (.005)	**	0.011 (.052)	**
High learning time (> 24 months)	0.985 (.419)	**	0.903 (.422)	**
Low learning time (< 6 months)	0.099 (.300)		0.104 (.301)	
Training with current employer	1.082 (.354)	***	1.054 (.365)	***
Training with previous employer	0.315 (.351)		0.294 (.351)	
Tenure	0.038 (.019)	**	0.034 (.020)	*
Quality circle (time t)	-0.695 (.464)			
Quality circle (yes, time t & t-5)			-1.521 (.661)	**
Quality circle (yes time t; no t-5)			0.111 (.558)	
Suggestion system	1.492 (.277)	***	1.444 (.272)	***
Appraisal (time t)	1.129 (.339)	***		
Appraisal (yes, time t & t-5)			1.395 (.424)	***
Appraisal (yes time t; no t-5)			0.606 (.534)	
Information	1.072 (.763)		0.907 (.747)	
Consultation	0.986 (.294)	***	0.965 (.297)	***
Increase in discretionary power (between t-5 and t)			0.481 (.331)	
constant	0.886 (2.026)		0.722 (1.928)	
Number of obs.	3224		3224	
F (19, 3204)	22.76		19.55	
Prob > F	0.0000		0.0000	
R-squared	0.2072		0.2143	
Root MSE	4.3465		4.3302	

Table 7 - Dependent variable: index of competence 'COMMUNICATION WITH COLLABORATORS'
Weighted OLS estimates, with heterosckedasticity-robust standard error. Levels of confidence: *** = 1%, ** = 5%, * = 10%

Indip. variables	Mod_5 Coefficients (s.e.)	l.o.c.	Mod_6 Coefficients (s.e.)	l.o.c.
Gender: 1-M (2-F)	-0.313 (.181)		-0.009 (.182)	
Establishment size	-0.0002 (.0001)	***	-0.0002 (.0001)	***
Temporary contract (time t)	-0.478 (.273)	*	-0.477 (.279)	*
Change contract: from temporary (t-5) to permanent (t)			-0.273 (.288)	
Part time contract (time t)	-0.185 (.232)		-0.178 (.231)	
Change contract: from part-time (t-5) to full-time (t)			-0.148 (.397)	
Schooling	-0.174 (.168)		-0.143 (.177)	
Schooling^2	0.013 (.006)	**	0.011 (.006)	*
Work experience (WEXP)	0.0051 (.041)		-0.053 (.043)	**
WEXP^2	0.0006 (.001)		0.0006 (.001)	
Schooling*WEXP	0.006 (.003)	*	0.006 (.003)	
High learning time (> 24 months)	0.588 (.296)	**	0.526 (.295)	*
Low learning time (< 6 months)	-0.461 (.204)	**	-0.441 (.203)	**
Training with current employer	0.765 (.222)	***	0.760 (.231)	***
Training with previous employer	0.110 (.238)		0.083 (.234)	
Tenure	0.024 (.012)	*	0.023 (.013)	*
Quality circle (time t)	0.564 (.344)	*		
Quality circle (yes, time t & t-5)			0.209 (.525)	
Quality circle (yes time t; no t-5)			0.913 (.391)	**
Suggestion system	0.925 (.165)	***	0.871 (.164)	***
Appraisal (time t)	0.569 (.227)	***		**
Appraisal (yes, time t & t-5)			0.585 (.267)	**
Appraisal (yes time t; no t-5)			0.426 (.383)	
Information	1.049 (.532)	**	0.981 (.491)	**

	0.775 (.192)	***	0.752 (.194)	***
Consultation	0.775 (.192)	***	0.752 (.194)	***
Increase in discretionary power (between t-5 and t)			0.506 (.219)	**
constant	1.995 (1.204)	*	1.788 (1.271)	
Number of obs.	3224		3224	
F (19, 3204)	27.12		23.46	
Prob > F	0.0000		0.0000	
R-squared	0.2535		0.2591	
Root MSE	2.7267		2.7186	

Table 8 - Dependent variable: index of competence 'TEAM WORKING'

Weighted OLS estimates, with heterosckedasticity-robust standard error. Levels of confidence: *** = 1%, ** = 5%, * = 10%

	Mod_5		Mod_6	
Indip. variables	**Coefficients (s.e.)**	**l.o.c.**	**Coefficients (s.e.)**	**l.o.c.**
Gender: 1-M (2-F)	-0.371 (.227)	*	-0.372 (.228)	*
Establishment size	0.0003 (.0001)	***	0.0003 (.0001)	**
Temporary contract (time t)	0.589 (.473)		0.684 (.478)	
Change contract: from temporary (t-5) to permanent (t)			0.716 (.419)	*
Part time contract (time t)	-0.496 (.382)		-0.514 (.378)	
Change contract: from part-time (t-5) to full-time (t)			0.138 (.640)	
Schooling	-0.199 (.223)		-0.221 (.225)	
Schooling^2	0.009 (.007)		0.009 (.008)	
Work experience (WEXP)	-0.027 (.052)		-0.015 (.053)	
WEXP^2	0.0001 (.001)		-0.0002 (.001)	
Schooling*WEXP	0.003 (.004)		0.003 (.004)	
High learning time (> 24 months)	0.159 (.335)		0.158 (.328)	***
Low learning time (< 6 months)	-0.646 (.255)	***	-0.663 (.252)	
Training with current employer	0.219 (.280)		0.216 (.285)	
Training with previous employer	-0.015 (.391)		-0.012 (.391)	
Tenure	0.016 (.014)		0.018 (.014)	*

Quality circle (time t)	1.241 (.440)	***		
Quality circle (yes, time t & t-5)			0.889 (.718)	
Quality circle (yes time t; no t-5)			1.528 (.441)	***
Suggestion system	1.812 (.246)	***	1.795 (.247)	***
Appraisal (time t)	0.978 (.273)	***		
Appraisal (yes, time t & t-5)			0.980 (.313)	***
Appraisal (yes time t; no t-5)			0.944 (.387)	***
Information	0.331 (.473)		0.316 (.496)	
Consultation	0.656 (.272)	**	0.656 (.276)	**
Increase in discretionary power (between t-5 and t)			0.151 (.276)	
constant	6.308 (1.582)	***	6.241 (1.586)	***
Number of obs.	3224		3224	
F (19, 3204)	18.72		17.07	
Prob > F	0.0000		0.0000	
R-squared	0.1898		0.1931	
Root MSE	3.3867		3.3824	

Table 9 – Treatment of endogeneity of organizational characteristics by means of 'personality traits'

	Var. dip. **Total key competence**		Var. dip. **Problem solving**		Var. dip. **Communication with clients**		Var. dip. **Communication with collaborators**		Var. dip. **Team working**	
	Mod_7	Mod_8	Mod_7	Mod_8	Mod_7	Mod_8	Mod_7	Mod_8	Mod_7	Mod_8
Other previous variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Tenure	0.080 (.037) **	0.084 (.037) **	0.039 (.017) **	0.042 (.018) **	0.033 (.019) *	0.030 (.019)	0.022 (.012) *	0.022 (.012) *	0.0125 (.014)	0.015 (.014)
Quality circle (time t)	2.548 (.977) ***		1.408 (.419) ***		-0.622 (.456)		0.620 (.341) *		1.207 (.431) ***	
Quality circle (yes, time t & t-5)		1.566 (1.488)		1.041 (.574) *		-1.170 (.669) *		0.393 (.518)		0.995 (.706)
Quality circle (yes time t; no t-5)		3.423 (1.095) ***		1.728 (.522) ***		-0.083 (.563)		0.846 (.409) **		1.363 (.433) ***
Suggestion system	3.963 (.608) ***	3.867 (.605) ***	1.307 (.326) ***	1.256 (.326) ***	1.177 (.277) ***	1.150 (.275) ***	0.784 (.168) ***	0.741 (.166) ***	1.655 (.246) ***	1.643 (.245) ***
Appraisal (time t)	1.871 (.708) ***		0.082 (.349)		1.087 (.322) ***		0.558 (.219) ***		0.939 (.275) ***	
Appraisal (yes, time t & t-5)		2.041 (.856) **		0.078 (.448)		1.365 (.398) ***		0.581 (.254) **		0.949 (.315) ***
Appraisal (yes time t; no t-5)		1.403 (1.053)		-0.015 (.431)		0.580 (.494)		0.421 (.362)		0.909 (.384) **
Information	1.119 (1.171)	1.065 (1.231)	-0.160 (.548)	-0.196 (.581)	0.885 (.745)	0.760 (.752)	0.898 (.478) *	0.845 (.452) *	0.462 (.490)	0.463 (.512)
Consultation	2.132 (.668) ***	2.081 (.675) ***	0.729 (.338) **	0.704 (.340) **	0.850 (.283) ***	0.828 (.284) ***	0.709 (.186) ***	0.686 (.187) ***	0.616 (.267) **	0.613 (.270) **
Increase in discretionary power (between t-5 and t)		1.119 (.706)		0.552 (.353)		0.423 (.312)		0.481 (.215) **		0.119 (.272)
Personality trait_1	0.551 (.403)	0.543 (.407)	-0.028 (.192)	-0.032 (.194)	0.247 (.168)	0.244 (.172)	0.132 (.101)	0.129 (.102)	0.384 (.162) **	0.382 (.162) **
Personality trait_2	0.364 (.454)	0.344 (.457)	0.302 (.224)	0.293 (.225)	-0.003 (.184)	-0.020 (.187)	-0.066 (.112)	-0.076 (.113)	0.094 (.173)	0.096 (.174)
Personality trait_3	0.470 (.215) **	0.459 (.217) **	0.217 (.108) **	0.214 (.108) **	0.399 (.093) ***	0.390 (.093) ***	0.161 (.064) **	0.157 (.064) **	-0.040 (.084)	-0.040 (.084)
Personality trait_4	3.142 (.748) ***	3.118 (.769) ***	1.709 (.319) ***	1.706 (.327) ***	1.54 (.365) ***	1.493 (.376) ***	0.943 (.281) ***	0.921 (.287) ***	0.159 (.304)	0.175 (.305)
Number of obs.	3224	3224	3224	3224	3224	3224	3224	3224	3224	3224

F (23, 3200)	34.65	30.72	25.66	22.04	21.37	19.54	24.24	22.22	17.79	16.26
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.3484	0.3521	0.2914	0.2957	0.2379	0.2428	0.2715	0.2758	0.2044	0.2076
Root MSE	8.0027	7.9858	3.8876	3.8788	4.2640	4.2536	2.6953	2.6893	3.3581	3.3541

Table 10 – Treatment of endogeneity of:
- **tenure by means of 'instrumental variabiles'**
- **organizational characteristics by means of 'personality traits'**

	Var. dip. Total key competence		Var. dip. Problem solving		Var. dip. Communication with clients		Var. dip. Communication with collaborators		Var. dip. Team working	
	Mod_7	Mod_8	Mod_7	Mod_8	Mod_7	Mod_8	Mod_7	Mod_8	Mod_7	Mod_8
Other previous variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Tenure (instrumented)	0.596 (.488)	0.628 (.502)	-0.062 (.238)	-0.055 .245	0.712 (.306) **	0.701 (.309) **	0.780 (.147)	0.067 (.150)	0.229 (.200)	0.266 (.207)
Quality circle (time t)	2.311 (1.045) **		1.455 (.437) ***		-0.934 (.649)		0.594 (.350) *		1.107 (.461) **	
Quality circle (yes, time t & t-5)		1.552 (1.424)		1.043 (.604) *		-1.186 (.796)		0.392 (.507)		0.989 (.704)
Quality circle (yes time t; no t-5)		2.894 (1.392) **		1.822 (.548) ***		-.735 (.960)		0.802 (.449) *		1.119 (.539) **
Suggestion system	4.265 (.730) ***	4.153 (.718) ***	1.247 (.373) ***	1.205 (.370) ***	1.574 (.437) ***	1.503 (.422) ***	0.816 (.197) ***	0.765 (.190) ***	1.782 (.298) ***	1.775 (.298) ***
Appraisal (time t)	2.072 (.783) ***		0.042 (.384)		1.351 (.453) ***		0.580 (.233) ***		1.023 (.310) ***	
Appraisal (yes, time t & t-5)		2.106 (.873) **		0.066 (.472)		1.445 (.508) ***		0.586 (.253) **		0.978 (.354) ***
Appraisal (yes time t; no t-5)		1.794 (1.262)		-.0085 (.465)		1.062 (.746)		0.453 (.391)		1.090 (.468) **
Information	1.121 (1.666)	1.059 (1.813)	-0.146 (.497)	-0.194 (.512)	0.791 (1.475)	.752 (1.498)	0.889 (.453) **	0.844 (.440) **	0.432 (.682)	0.460 (.750)
Consultation	2.245 (.691) ***	2.185 (.699) ***	0.706 (.349) **	0.684 (.351) **	0.999 (.402) **	.957 (.401) **	0.721 (.187) ***	0.695 (.187) ***	0.663 (.279) **	0.660 (.285) **
Increase in discretionary power (between t-5 and t)		1.342 (.769) *		0.511 (.357)		.697 (.468)		0.499 (.229) **		0.221 (.309)

Personality trait_1	0.394 (.430)	0.380 (.431)	0.001 (.206)	-0.002 (.208)	0.041 (.244)	.043 (.240)	0.115 (.113)	0.115 (.112)	0.318 (.173) *	0.307 (.175) *
Personality trait_2	0.351 (.460)	0.338 (.462)	0.304 (.227)	0.294 (.229)	-0.019 (.246)	-.026 (.244)	-0.067 (.111)	-0.076 (.112)	0.088 (.176)	0.092 (.179)
Personality trait_3	0.444 (.227) **	0.437 (.230) *	0.222 (.109) **	0.217 (.109) **	0.365 (.131) ***	.362 (.130) ***	0.157 (.064) **	0.154 (.064) **	-0.050 (.091)	-0.050 (.093)
Personality trait_4	3.139 (.804) ***	3.159 (.833) ***	1.709 (.324) ***	1.698 (.330) ***	1.538 (.532) ***	1.544 (.535) ***	0.943 (.283) ***	0.924 (.288) ***	0.157 (.329)	0.193 (.338)
Number of obs.	3224	3224	3224	3224	3224	3224	3224	3224	3224	3224
F (23, 3200)	26.75	23.45	24.60	21.06	8.61	8.13	22.56	20.98	14.98	12.54
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R-squared	0.2372	0.2296	0.2715	0.2775	..	..	.2584	.2675	0.0681	0.0271
Root MSE	8.6584	8.7081	3.9417	3.9284	6.0893	6.0326	2.7195	2.7047	3.6346	3.7166