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An assessment of the literature.

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PRODUCTIVITY AND NEW WORK ORGANIZATION

An assessment of the literature

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Abstract

The paper presents a literature review on the characteristics of new forms of work organization, with respect to traditional Taylor-Fordist organization, and their impact on productivity. The analysis is developed primarily with reference to the world of manufacturing firms, focusing particularly on the roles established by new organizational design, new work practices, new technologies (ICT), industrial relations and their complementarities.

The new organizational configuration that effectively emerges from the literature is characterized by a set of innovative bundles of work practices made up not only of different 'ingredients' but also of the different weights of each ingredient. Hence, the employer and/or manager has two levers to pursue efficiency and performance: ingredients and their indefinable combination.

The superior performance of this new work organization – in line with lean production paradigm (sometime called World Class Manufacturing - WCM) – is clearly acclaimed by a number of econometric studies despite the fact that some methodological questions remain open, which unless resolved will not aid in overcoming the resistance of sceptics, be they academics, practitioners, managers, trade union leaders or policy makers.

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1. Introduction

Empirical research has widely documented, virtually without exceptions, enormous and persistent measured productivity differences across firms or establishments, even within narrowly definite industries. Syverson (2004), for example, demonstrates that within 4-digit SIC industries in the U.S manufacturing sector, the ratio of total factor productivity among plants at the 90th percentile of productivity distribution is in the order of 2 to 1 with respect to the 10th percentile, namely, *twice* the amount. However, this accounting refers to the average 90-10 range: taking into account the range's standard deviation, a plant at the 90th percentile of productivity distribution is over *four times* as productive as a plant at the 10th percentile in the same 4-digit sector.

Mainstream economic theory attributes different productivity levels, as well as different changes, to a set of factors such as: (i) capital accumulation per employee or per hour worked (capital deepening); (ii) new investments as a mechanism to transmit new ideas (technological progress embodied in capital goods); (iii) exogenous (or disembodied) technical progress flowing mainly from one or more sources of learning such as learning-by-doing, learning-by-using, learning-by-interacting and learning-by-searching; (iv) returns to scale; (v) R&D activity; (vi) externalities (infrastructures, intra-market competition, regulations, schooling system, public administration, etc.). However, the cornerstone has always been (vi) allocative efficiency,[1] in spite of Leibenstein's effort (1966) to draw the attention of scholars to the fact that «*the data suggests that in a great many instances the amount to be gained by increasing allocative efficiency is trivial while the amount to be gained by increasing X-efficiency is frequently significant*» (*ibidem*: 413). A consequence of this frustrated effort is that work organization, such as job and workplace design, and human resource management, has been largely neglected – from a theoretical and modelling perspective – as a potentially powerful source of productivity.[2]

Only quite recently has empirical evidence begun to appear on the scope of different forms of work organization and human resource management practices, as well as on their effects on firm productivity, based on econometric estimates using different types of data (firm or establishment level, panel or cross-section datasets). We devote section 3 to a detailed survey of this literature, but we can already disclose that the key results converge in sustaining a positive association between *new* work organization – including just-in-time, team working, job rotation within and across teams, participation in problem-solving groups, suggestion systems, job design and delayering, the existence of multiple incentives to boost motivation such as performance-related pay and participation in decision making – and firm productivity.

However, the empirical results are not without problems, to the point that at times they have given rise to diverse interpretations and extremely critical evaluations (Godard, 2004). For example, as concerns new work practices, a distinction is not always made between the *extension* of their adoption amongst the firm population, which can be represented by a simple dummy variable, and the *intensity* of adoptions of each work practice, which requires a *scalar variable*. At the same time, a given work practice can have several dimensions, which in turn need to be treated with a *vector variable*. In addition to these problems, the extension and intensity of new work practices that a researcher measures need to be clearly understood as both their size and their effects could depend on a set of factors such as: (i) firm starting conditions, (ii) time spent from the beginning of the re-engineering process, and (iii) the internal resistance that Schumpeterian employers and/or managers face during the re-engineering process. The risk is dealing with variables that

[1] See for example, Foster *et al.'s* (2001) overview on the role of economic activity reallocations toward higher productivity producers (both among existing plants and through entry and exit) in explaining aggregate productivity growth. For more recent empirical investigations see Maksimovic and Phillips (2002), Lentz and Mortensen (2008), and Bartelsman *et al*. (2009). Caveats can be raised in respect of these works because they do not explain the reason for the productivity increase of firms located on the frontier.

[2] One exception is Comin and Mulani's (2006) study, where the development of productivity is modelled as a result of managerial and organizational techniques, personnel, accounting and work practice innovations.

capture, at the time of a given empirical survey, an incomplete implementation either of a new work practice, or of a bundle of these, thus fostering potentially divergent effects and interpretations.

An aspect of the relationship between workplace characteristics and firm productivity that should be pointed out is the existence of complementarity (or super-additivities, according to the terminology used by Milgrom and Roberts, 1995) among work practices, which would imply that implementing (more of) any one of these should increase the returns to implementing (more of) the others (*ibidem*: 181). Complexity increases when complementarity encompasses other features of the firm, such as new technology and industrial relation «regimes». The questions of *how* a bundle forms, *which* elements form part of the bundle, *what* intensity of each element fits better and whether a «best and wider bundle» exists, are still far from fully answered; we will address these questions in section 4.

A relevant question to confront is whether these bundles are consistent with the 'contingency approach' or are they of a 'universalistic' nature, regardless of the structural shape of the organizational form of the firm. In the first case, different bundles implemented in different firms could be interpreted as a result of the 'degree of freedom' in combinations contingently selected by managers according to some relevant 'state of the world' or simply to their «weltanschauung». An alternative way of looking at the question is whether these bundles are a set of building blocks used to re-engineer the organizational form, passing from a traditional (Taylor-Fordist) model, based on functions, towards an innovative model based on processes (called lean production or Ohnist model). In the latter case, it would be useful to remember that each bundle implemented in a given firm (and as such, observed by the researcher with his empirical investigations at a given point in time) should more likely be considered as part of a long process, that is, as a specific phase of a Gannt diagram.[3] If this were the case, the sequence of building blocks to be implemented would have a unique path, whose violation could be responsible for the inefficacy of some bundles of new work practices simply because the preceding part of the process may have been omitted.

Despite the broad consensus that new work practices have obtained in management and industrial relations literature (Kochan and Osterman, 1994; Pfeffer, 1998), there is a need to scrutinise these variables more thoroughly, and above all the most appropriated metric to be used (dummy, scalar or vector) to represent each single phenomena investigated, and thereafter to construct variables to test their effects on firm productivity. This paper aims to survey studies on the relationship between new forms of work organization and productivity of a stylized manufacturing firm, emphasizing the positive and negative aspects of the most accredited results.

When jointly implemented, complementarities between new organizational work design, new work practices and ICT represent a clear departure from existing traditional practices; they give rise to a different configuration of the firm and new lifeblood, raising the question of whether the new firm configuration should be considered as the point of reference for a «*new one best way*». To our understanding, an interpretation and explanation of all this may require going beyond Nelson and Winter's (19982) evolutionary approach – passing through the J-firm (Aoki, 1990) – and arriving at Nooteboom's cognitive theory of the firm (2009). It does not appear to be a matter of selecting the most efficient routines, but of seeing how competence building, learning and innovation take place since they are among the most powerful contenders to explain – in a dynamic perspective – the *essence* of the firm.

A new key view that could emerge from the literature we are going to critically survey seems to have been clearly anticipated by Grandori (2005) when asserting that organization design has to be at the root and at the *core* of organization science. At the same time, empirical investigations on organizational design in this period seem capable of enlightening and enriching not only the reasons for structural productivity

[3] A Gannt diagram illustrates the start and end dates of the various portions of activities or phases of a project. The sum of these phases gives rise to the project's work breakdown structure, called - in our case - BPR (Business Process Reengineering). The sequentiality of various phases shows the dependency relationship between phases.

dispersion among firms, but also internal factors that may contribute to determining the heterogeneous *dynamics* of productivity. This is the case especially if taking into consideration that bundles of new work practices and new organizational features of firms, in addition to ICT, are to a certain extent responsible on one side for both knowledge creation and diffusion, which lead to product and process innovations (Gritti and Leoni, 2011), and on the other, the informal development of key competences (Leoni, 2011).

The determinants of productivity are manifold, and the aim of the paper is to survey and evaluate recent empirical studies concerning the contribution of alternative ways of work organization on manufacturing firm productivity, irrespective – given our aim – of any other sources. The paper is structured as follows: section 2 examines the origin of the new approach, section 3 focuses on the pillars of new work organization and their complimentaries, section 4 considers ICT as a fourth pillar and section 5 looks at the diffusion of new work organization. Section 6 considers the most relevant and still-open questions, while some final remarks are offered in section 7.

2. The origin of the new approach

Academic research usually attributes the growth of Western economies in the 1945 to 1970 period to cumulative productivity gains brought about by the inter-relationship of a number of factors including: dedicated technology; a Taylorist factory and labour organization system;[4] some revenue sharing between workers and firms; consumption linked to the growth of real wages, and finally, investment dynamics based on the accelerator principle, together with the notion that improvements in technology would be incorporated in the last vintage of capital (Appelbaum and Batt, 1994: 14).

Subsequently, however, the system broke down as a result of the ability of some new emerging countries (see Japan) to compete on price in the product market. The outstanding performance of Japanese companies, especially Toyota and Ohno's lean production model, led an MIT Commission (Dertouzos, Lester and Solow, 1989) to investigate the productivity differential in U.S. and Japanese firms, paying particular attention to organizational factors. The fear of foreign domination of the American market (Womack *et al*. 1991: 274), generated in the course of the 80's, prompted managers of the largest corporations to first seek public barriers against Japan's competitiveness, and then to understand and imitate the way of organizing the enterprise. The most striking example is the joint venture between General Motors and Toyota, which gave rise to the extraordinary success of NUMMI (*ibidem*: 278), based on American technology but with Japanese organizational management.[5] This example set a fashion, getting rid of the weak attempts to keep the old production system alive with margin adjustment operations, prompted on one side by psychological organizational behaviour theories, by motivation and job enlargement and job enrichment, and on the other, by the idea of cutting costs through reducing the workforce employed for an indefinite period, the extensive use of programmable machine tools, outsourcing and the use of atypical workers.

The remarkable productivity results, product quality and satisfaction of workers attained, inspired not only the organizational efforts of two other pilot schemes, GM's Saturn project, also in the USA, and Volvo's factory in Uddevalla (Sweden), but also the proliferation of articles in the most prestigious management journals, which *de facto* accredited the greater universality and portability of this organizational model in other countries and thus facilitated its spread in many American and European firms. The main characteristics of the new corporate production model are summarized by a stream of studies known as lean

[4] This system comprises the separation between conception and execution, the use of dedicated large-scale facilities, and the detailed division of labour in routine tasks to produce large volumes of standardized products.

[5] According to Adler *et al*. (1998), Toyota's decision to enter into partnership with GM in the NUMMI project can be viewed as the attempt by Japanese management (followed by other Japanese companies) to overcome the trade dispute with the U.S. and build factories in America. From here begins the story of the Japanese transplants, first in the U.S. and then in Europe, that have tended to privilege greenfield rather than brownfield investments.

production (or Toyotism, or WCM – World Class Manufacturing). Lean is not only a set of tools that assist in the identification and steady elimination of waste, followed by quality improvements and production time and cost reductions. Lean also means a flow or smoothness of work, thereby steadily eliminating unevenness throughout the system instead of 'waste reduction' per se. In addition, on the management side, lean also means abandoning three of the most important traditional management techniques, respectively *standard costing* in favour of *activity-based costing*, *management-by-objectives* in favour of *activity-based management*, and finally traditional planning and control in favour of *activity-based budgeting*, all relatively well known concepts and tools that here require no further articulation. It seems important instead, for the purposes of our aim, to dwell on two aspects: process organization and multi-valence/multi-competencies.

The former is a profound reversal of the way of understanding the organization of activities, passing from functions to processes. This is defined by Hammer and Champy (1993) as the sequence of all activities (from planning to production and marketing) that absorb resources (one or more inputs) and create output value for the customer. Compared to pyramidal organization, where the individual 'functional' units are structured as real silos with their own hierarchies on top, organization 'by processes' recomposes into units the various activities that cross over the 'functional' units, putting them in the hands of a manager (the process-owner) who relates on the one hand as a real supplier with the customer, and on the other as a real customer with internal suppliers (constituted by support activities). Indeed, for Coriat (1991), organization as intended by Toyotism's founder (Ohno, 1988) is actually "designed in reverse" in that it begins from the customer, while the sequence of activities designed to please the customer are recomposed in reverse.[6] The most important partner of this approach is modern ERP technology (Enterprise Resource Planning), a software system that supports not individual functional areas but the entire business process.[7]

The second aspect concerns the multi-valence and multi-competencies of the employee; effective towards their construction are mentoring, job rotation (first within and thereafter among production islands/teams), on-the-job training, directing classroom training to respond to Lundall and Johnson's (1994) *know-why* criterion, and finally, short-term economic incentives designed to recognize and encourage learning rather than to achieve results: thus, input-oriented rather than output-oriented incentives. The objective is to build the roles and competencies that are closest to those required, which include - in this new context - not only the execution of certain actions, but also the maintenance of the technology of the postings (both white and blue collar), ensuring that the role holder acquires mastery of the structure, functions, the operating mechanisms of the artefact and the production process as well as quality control exercises at each manufacturing stage of processing, identifying the defects and their causes from when they first form (Koike, 1994).[8] All this involves dismantling the traditional quality control system carried out for statistical sampling at the end of the product's construction,[9] in favour of ongoing control. Work competencies thus constructed are no longer ascribable to only those pertaining to implementation, the identification of defects and causes, and troubleshooting, but also include those related to changes (fluctuations in production volumes, new products, new production methods) and the problems that arise from these.

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[6] According to Hammer and Champy (2001: 6), investments to activate simple e-commerce, without giving rise to the re-engineering of business processes, would also have met with frustration: "*in the absence of robust, reengineered processes, electronic commerce is a nightmare, not a dream"*.

[7] The relevance of this 'complementarity' is the fact that firms have tried to implement it without first re-engineering organization from the process perspective, achieving modest, if not disappointing, results.

[8] The quality system along the process is assured, as well as technological devices such as poka-yoke, precisely a diagnostic check *by eyes*, the effectiveness of which requires owning nontrivial cognitive skills, and a significant degree of involvement.

[9] It is worth mentioning that the cost of traditional quality control is not limited to only a control service, but also includes the value of sales contested by customers due to quality defects.

3. The pillars of new work organization: new organizational design, new work practices, positive industrial relations and their complementarities

Lean production is a multi-dimensional approach that encompasses a wide variety of work practices and organizational designs, which differ markedly from the Taylor-Ford tradition. Lean production can be described from two perspectives: the first is a philosophical perspective relating to guiding principles (Womack and Jones, 1996); the second is a practical perspective of a set of organizational design and work practices that are linked to better performance and can be directly observed.[10] However, since lean production focuses not only on setting a goal for a specific level of leanness, but also for a continuous improvement process (Fujimoto, 1999), it would be inappropriate, in our understanding, to set a definition of the lean production model starting from the instruments or superficial characteristics of the organizational structures – such as Kanban, *andon cords*[11] or similar tools, which so many outsiders have emphasized – in that they not only represent a temporary response to specific problems, but risk being used by theoreticians to establish an interpretation.

Attention to the underlying fundamental characteristics of the second perspective gave rise to the acronym HPWO (*High Performance Work Organization*) to indicate organization that has the potential to increase productivity in the short term and to increase the productivity growth rate in the long term, thanks to these intrinsic properties and to those autopoietic mechanisms that the new work organization is endowed with.

Much of the literature, however, provides an interpretation of the new work organization that very much leans on the side of human resources and work practices, which has fostered the creation of a new acronym, HPWPs (*High Performance Work Practices*) emphasizing the 'high involvement' dimension underlying the new work practices.[12] The core set of practices commonly identified as composing the high-involvement model and generating higher productivity includes on-line teams, participation in problem solving groups, multiple incentives to boost motivation such as performance related-pay and participation in decision making, suggestion systems, selection based on psychometric tools to single out transversal and technical competencies, extension training on relational, managerial and cognitive competencies: see, for example, Huselid (1995), MacDuffie (1995), Ichniowski, Shaw and Prennushi (1997), Black and Lynch (2001, 2004) and Boning *et al*. (2007) for the US; Patterson, West, Lawthom and Nickell (1997) and Guest *et al*. (2003) for the UK; Bauer (2003) and Zwick (2004) for Germany; Greenan and Guellec (1998), Janod and Saint-Martin (2004) on French data, Caroli and Van Reenen (2001) on both French and UK data; Cristini *et al.* (2003), Piva *et al*. (2005) and Mazzanti *et al*. (2006) for Italy; and Bloom and Van Reenen (2007) for several industrialized countries (namely, the US, UK, France and Germany), and Rizov and Croucher (2008) for

[10] For a review of lean production definitions see De Treville and Antonakis (2005, pp. 101-105), and Shah and Ward (2007, pp.786-792).

[11] A tool used by a worker who is having difficulty in completing the task within the cycle, or is encountering a production or quality problem, in order to signal to the team leader the need for support.

[12] At times the 'high involvement' dimension is viewed as conveying the assumption that new work practices express their effects conditional on managerial circumstances that enhance involvement. In these cases, involvement acts as a 'mediator' variable between work practices and productivity; this role gave rise to a new acronym, HIM (*High Involvement Management*). A mediator role is usually tested by a specific equation system, where the dependent variable yielding the mediator role is first regressed with respect to a set of new work practices, and then used as a covariate in the main equation explaining productivity. This is a way to both investigate and reveal the underlying 'nature' of a set of productivity-enhancing work practices that can be ascribed to a motivation and involvement management style or management-by-stress style. See Wood (1999, p. 369-372) for a more detailed review of the terminology surrounding HIM.

European firms.[13] The emphasis of this literature is on new work practices practiced by workers and hence on the supply side of labour.[14]

Several studies have already endeavoured to synthesize the literature with a narrative review (Huselid and Becker, 1966; Ichniowski *et al*., 1996; Wood, 1999; Addison, 2005; Becker and Huselid, 2006; Ichnioswki *et al*., 2009; Bloom and Van Reenen, 2010). Methodological issues are at the core of the critical aspects: omitted-variable bias, heterogeneity bias, response bias, subjective judgments, the role of responders (top-level managers *versus* multiple responders at different levels and in different roles within the organizations), identifying bundles, longitudinal *versus* cross-sectional datasets, unit of analysis (firm, establishment or workplace), endogeneity. Each study not only attempts to critically cover the new literature, but also uses a particular lens to identify key issues and new research directions.

This is particular true of the last two surveys, where the former places strong emphasizes on the fact that all empirical studies are non-experimental, and as such lack random assignment. Starting from the 1996 review, Ichniowski manifested his main concern on the causality issue, which is resumed and further developed in Ichniowski *et al*. (2009). His argument is that researchers normally control for selection bias – for example using Heckman's two-step procedure or another adoption equation - between respondents and non-respondents, controlling for endogeneity and thereafter testing the treatment effects between those firms adopting and not adopting new management practices; but these are the traditional problems in using non-experimental data, i.e., survey data. Ichniowski *et al*. (2009), observe that unfortunately «*we can't know the unobserved counterfactuals about what would have happened if non-adopting firms adopted some new management practice or if adopting firms had not adopted*» (*ibidem*: 7). The novel experiment by Bloom *et al*. (2011), as providers of free management consulting to a random set of Indian textile firms, effectively test the 'genuine' treatment effect of lean manufacturing practices randomly assigned across different plants. They found a strong and positive productivity effect in the treatment group compared to the set of control firms that were not recipients of the intervention. This is surely a very positive step towards controlling for selection bias, but a further step would be to also randomly select both managers of different production units and individual workers (or groups of workers) within the same unit. This objective, however, runs the risk of being ineffectual if managers do not adopt new practices randomly, or if they do not adopt single practices but multiple practices that complement each other, or if the performance of the individuals or groups of workers 'treated' are not isolable.

The second of the two above-mentioned surveys focuses on studies relating management practices to productivity (most signed by the same authors). Bloom and Van Reenen's (2007) database is very appealing: over 700 managers of medium-sized firms in the US, UK, France and Germany, with the measured practices revolving around day-to-day and close-up operations rather than broad strategic choices made on the executive level. Information was probed on 18 specific management practices in four broad areas: operations, monitoring, targets and incentives. Bloom and Van Reenen's (2010) database is extended further to cover nearly 6000 firms in 17 countries. The emphasis is placed on management practices activated by managers (expressed as practices requested of workers and thus on the demand side), and whether the positive productivity effect is due to the talent of the managers themselves or the quality of their practices (seen as managerial inputs). This is an interesting but still open argument, since most of these practices derive from recommendations of the management consulting industry. The novelty of the results is that management practice scores are lower when the firm is family-owned *and* primogeniture has determined the

[13] In order to check whether the return from investments in HPWPs exceed their costs, by lower employee turnover and greater productivity, with a consequent enhancing of financial performance, some researchers focused on valued firm-level performance as a dependent variables, finding positive results (see: Huselid, 1995; Colombo *et al*., 2007).

[14] On the distribution of productivity gains between firms and workers the evidence is mixed: Black and Lynch (2004) and Osterman (2006) find higher performance and higher wages, while Freeman and Kleiner (2000) and Freeman *et al*. (2000) find weak effects on productivity but strong and positive effects on workers' well-being; similar results are supported by Gardell *et al.* (1991) for Scandinavia.

current CEO's succession, i.e., he is the eldest son of the firm's founder. This variable and that reflecting best-practice management affect competition in the firm's market, which in turn influences the firm's outcomes (productivity included). These two factors are responsible for explaining most of the differences between the productivity of firms and countries.

The transversality of the adoption of practices typical of lean production and the positive results arising therefrom, measured in firms belonging to different industries and countries (industrialized and developing), argue against a contingency view of the organizational and managerial practices, which instead illustrates that every firm adopts its own best practices given the circumstances in which it finds itself.

The great majority of the above-mentioned studies tend to concentrate on work practices (supply side) or on management practices (demand side) with respect to employees. Scant attention is paid instead to organizational design in the strict sense, such as, for example, internal organization (by process versus function), just-in-time, hierarchical levels versus job autonomy, job design (extended versus reduced job demarcations), team work versus individual work in relation to both productivity and other outcomes (job satisfaction, illness and injuries, firm propensity to innovation, etc.). However, a few studies include, among the covariates, variables reflecting organizational factors that mirror the new form of work organization. Amongst others, Bresnahan *et al*. (2002) Zwick (2004), Cristini *et al*. (2003), Bauer (2003), Bertschek and Kaiser (2004), Rajan and Wulf (2006) find that teamwork and flattening the firm's hierarchy (i.e., delayering) have a positive effect on productivity. Despite its crucial and characterizing role in lean production models, no studies (to our knowledge) have tested the discriminant value of an organization based on processes rather than on functions. In several of these studies, complementarity between innovative human resource management systems and some traits of new organizational design, namely, the *joint* effect on productivity, has been proven.

As regards industrial relations, more precisely, the 'collective involvement' of human resources, a distinction needs to be made: involvement may imply a direct relation between manager and employee, and an indirect relation between manager and worker representative (unions, works councils, etc.). While the former is management led and as such is usually included among human resource management techniques emphasizing high-commitment employment practices, the latter refers to the workplace activities of trade unions as an autonomous voice.

Within traditional organizational regimes, in the 1980s and 1990s, unions decreased both in prevalence and in power, at least in Europe and in the so-called 'liberal market economies' (USA, Canada, Australia, New Zealand and the UK) (Visser, 2003). With significant changes induced by business process reengineering, the union was presented with an opportunity to recoup its role, collecting information on the preferences of all workers and 'aggregate' them to determine the social demand for shared new working conditions. It is likely that without a collective type 'voice', workers have too little incentive to reveal their preferences when the outcome of such significant changes is due to several choices and the behaviours of a wide variety of agents. However, Freeman and Medoff (1984, p.65), drawing on the theoretical work of Hirschman (1970), assert that the 'voice' cannot succeed without an appropriate response from management (and vice versa: from unions in response to any changes proposed by management). At the same time, they predict that "some managers will adjust to the union and turn unionism into a positive force at the workplace; others will not ... [admonishing that] ... over the long run, those that respond positively will prosper while those that do not will suffer in the market place" (*ibidem*). The argument is extendable to include transaction costs, according to which unions can reduce these when employers/managers are facing big changes: i) by lowering resistance to organizational changes, paving the way for the introduction and development of productivity-enhancing practices in exchange for some benefit (pecuniary and non-pecuniary); ii) by improving organizational coordination through improving information flows to decision makers; iii) by reducing the cost of motivation of employers/managers towards workers; and iv) by lessening the moral hazard of supervisors (Willman *et al*., 2006). Paraphrasing Greenberg (1987) on organizational justice

theories, we retain that unions not only pursue *distributive justice* (by reacting to unfair distribution of both rewards and income, between profit and wage), but are also interested in *procedural fairness* (that is, fairness of procedures pursued to make organizational decisions and to implement those decisions, postulating that unions and workers would be more satisfied if they had process control with respect to when they do not) as well as in *relational fairness* (which concerns the nature of the relationship between the parties involved in organizational change, and the consequences of organizational changes on the social harmony of group members). These dimensions of the exchange between workers and employers/managers constitute the prerequisites of an employment relation characterized by mutual trust and respect, similar to a form of "gift exchange" (Akerlof, 1982), which may induce unions to legitimize the ensuing organizational changes (Bryson *et al*., 2005) when not assisting the counterparty in their management functions (Kochan and Orterman, 1994; Willman *et al*., 2006). In these contexts, collective bargaining at firm level may take the form of information exchange, consultation or negotiation around changes. Unfortunately, empirical research is not always instructive on the distinctive forms of these issues, leaving the question open of which of these actions is most efficient - providing that there is only one, and not various actions - based on the different industrial relations previously accumulated in managerial and organizational change projects and closely linked to the formal and informal exercising of power.

Studies that identify direct evidence on the combined impact of new organizational design, new work practices and the pro-active role of unions on productivity are: Black and Lynch (2001, 2004), Metcalf (2003), Cristini *et al*. (2003), Zwick (2004), Bryson *et al*. (2005), Mazzanti *et al*. (2006), even if it should be recognized that at times elements of the first two categories are mixed and not precisely the same.

Despite some concerns, due to some insufficiencies among the dataset used and heterogeneous methodologies applied in testing theoretical propositions, we retain that the empirical evidence (broadly considered) supports the positive and complementarity role of the triad: combinations of innovative practices and work representation can yield substantial productivity gains. Among the insufficiencies, longitudinal data is most cited, except for Germany, even if in this case a different shortcoming intercedes: industrial relations are often measured by the *presence* (or non) of works councils, almost always present in medium and large establishments, rather than trade union behaviours on the workplace level. The quality of information on organizational and work practices also matters. To these and other limitations, we shall return further on.

4. ICT as a new pillar of complementarities[15]

It is widely recognized that the traditional work organization, based on an extensive hierarchy, low levels of delegation and narrow skills, is inadequate to fully exploit the potential of general-purpose computer-based technology (ICT). The diffusion of the latter is expected to have a pervasive impact on the firm's life since it is likely to imply both technical and organizational changes, which in turn affect work practices and industrial relations. Higher computation speed allows processing a large quantity of data and enables new work techniques based on sophisticated and flexible machines and equipment (such as CNCs, flexible manufacturing systems, robotics, group technologies, automated stores). As far as the first dimension is concerned, to exploit the increased amount of computer-processed information, more employees are

[15] The search for complementarity should also extend to the role of competitive strategies (for example, innovation strategies) in relation to customers and suppliers: in fact, an array of internal and external complementarities should produce better performance. Robust empirical evidence in this direction is still to come, even if some results are starting to appear: for example Gritti and Foss (2010) find that customer satisfaction and loyalty in the banking industry affect profitability (the relationship is mediated by human resource competencies), while Bartel (2004) demonstrates the existence of a positive relationship between bank branch performance and employee satisfaction with the quality of performance evaluation, feedback, and recognition at the branch, namely, the 'incentives' dimension of a high performance work system.

empowered and given some decisional control (Brynjolfsson *et al*., 2002; Breshnan *et al*., 2002): communication is facilitated, information sharing among employees and between employees and managers is encouraged and this enhances employee involvement, autonomy and discretion. Participative industrial relations facing the new technological and work organization determine the new role of human resources, and strengthen the exchange of reciprocal trust.

As concerns the second dimension, positive effects on productivity are generated since ICT: i) allows more customized products; ii) improves the efficiency of all stages of the production process by reducing setup times, run times and inspection times (making it less costly to switch production from one product to another and consequently supporting the customization of products to meet individual requirements); new technologies promote customization not only of manufacturing products, but also of several services; and iii) increases the competency requirements of machine operators (technical and problem solving competencies), inducing the adoption of new work practices that implicitly and informally develop these competencies (Bartel *et al*., 2007; Leoni, 2011). Overall, these events are expected to trigger major re-organization processes within the firm: middle and line managers become crowded out, flattening the hierarchical structure; new workplace practices entailing employee involvement are adopted; competencies in technical, relational and cognitive skills are upgraded by training and job rotation, and trust is mutually exchanged.[16]

The decreasing cost of information technologies is not enough to produce a net productivity gain when not accompanied by new workplace design, new human resource practices and pro-active industrial relations: only simultaneous changes in the four components are expected to raise the productivity and quality of factors, enabling cost reduction, endorsing knowledge creation and eventually spurring innovation and firm growth. If the net gain to the firm's payoff is positive, investments in the four components (forming the four corners of a quadrilateral) are said to be complements.

This broad-brush progression of events is rather well observed and documented by the empirical literature, even if numerous studies exists that analyze the impact on productivity of a single component (for example, ICT: Athey and Stern, 2002; Brynjolfsson and Hitt, 2003; Hubbard, 2003) or two components (ICT and competencies, or ICT and new work practices: for the former, Caroli and van Reenen, 2001; Autor *et al*., 2003; for the latter, Black and Lynch, 2001; Bresnahan *et al*., 2002; Cristini *et al*., 2008). More difficult to find directly and explicitly are all four components simultaneously: usually one or two of the four are inferred in the sense that they are assumed coherent with the variable in question, or the three non-technological components are merged into a single set of variables, clearly due to the primary interest of exhaustively treating the technological variable, or finally, due to the implicit difficulty involved in dealing with very complex causal models, controlling for resulting endogeneity, heterogeneity and self-selection in the adoption of work practices.

It is worthwhile recalling that most of the quoted literature recognizes that firm specificities render each re-design process particular; a fully standardized re-organization scheme is difficult to conceive for various reasons: firm characteristics such as size, age, and the technical aspects of production may determine complementarity gains to a different extent. Due to the given firm characteristics, the reorganization process still involves some discretionary actions by managers, particularly if different strategies are possible; some complementary changes may be of a sequential rather than a simultaneous nature. Consequently, complementarity between the introduction of ICT and firm reconfiguration (implying organizational re-design, new work practices and positive industrial relations) is ultimately idiosyncratic and the complementarity-induced gains are firm specific. This could be interpreted as evidence in favour of a contingentist approach according to which there is not one absolute best organizational structure: the

[16] It is worthwhile noting that, using US data, Askenazy (2001) observes a positive correlation between the adoption of new technologies and new HRM practices (mainly job rotation) on one side and injuries and illness on the other; similar results are also obtained by Askenazy *et al.* (2001) for France. These are outcomes of a certain concern that are outside of the scope of this paper.

attractiveness of a model depends on its fit with the environment in which the firm operates. We do not fully agree with this interpretation, but will return to this argument later.

The distinctiveness of each firm renovation process explains why the empirical analysis is essentially of the micro-type, based on either case studies or firm-level data. In this regard, the latter type of data, if available for representative samples, allows more general conclusions than those obtained from case studies, but usually provides less detail on qualitative and non-accountable information. This is particularly limiting for the analysis in object since the reorganization of the workplace entails complex interactions of practices that concern various aspects of firm life.

There is also a time dimension, however, which is very important. Any workplace redesign, associated with investments in ICT, can be viewed as a process that evolves over time and takes some time to be completed. The delayed and time-phased effects of investments in the four components may give origin to results that do not always converge and are even negative in cases (see, for example, Cappelli and Nuemark (2001) where the estimates are made when the process of adjustment has not yet been completed, and the likely adjustment costs outweigh the gains. We shall return to this issue in section 6.

5. The diffusion of new work organization and the modern firm - between hybridization, managerial fashions and resistance to change

The positive results accredited by literature at times elicit scepticism and incertitude on the fact that the new work organization is not as diffused in Western as in Far-East economic systems, and in Europe as it is in the USA. Moreover, even in its variegated diffusion, implementation has not occurred linearly and swiftly, and with the intensity that might have been expected following the initially promising performance. We find different explanatory reasons in the literature, related to some extent to aspects that may lay some foundations for contingencies, which will be briefly described hereafter.

According to the first, new work organization had to be confronted in Europe with some models that had already partly evolved irrespective of US benchmarking. We here refer to the Swedish socio-technical model, the German co-determination and diversified quality models, the Italian models of flexible specialization and industrial districts, which *de facto* incorporated some of the characteristics of the Japanese model: team production in the Swedish case, the involvement of participative trade unions in the German case, relational capital among district firms in the Italian case. This prevented grasping the full scope of the lean model, and its revolutionary reversal of the traditional model. To this are added the captivating traits of the TQM movement, accrediting the gradualism of changes, compared to the radical changes of BPR (Business Process Reengineering), to achieving the real implementation of the new form of organization, rendering the cost of change more manageable since it can be diluted over time. Both BPR and TQM place focus on the process and on the customer, but rather than substituting one another, as often occurred, they should have been seen as complementary: in fact, BPR is a means of converting ‘functions’ into ‘processes’ while TQM is nothing but an organized Kaizen, namely, continuous improvement activities carried out by improvement groups (or quality circles) and by the suggestion system from the bottom, improvements that must be continuously pursued, in Japanese tradition, even after transforming the company into a lean organization. Moreover, the Western applicative nuances have rendered TQM a little different from the Japanese declination: more limited and more oriented to products in the former compared to the broader and more people-oriented (customers and employees) of the latter, thus reducing the impact of TQM, especially when implemented on the traditional organizational form.

The second reason is the enthusiasm surrounding the first positive findings, which soon transformed the re-engineering process into a managerial fashion[17] and into a panacea of corporate performance problems. Any action to reduce inefficiencies and optimization along the internal phases within individual organizational units has become 're-engineering', distorting the concept and scope of the BPR - a prelude to many failures. When a BPR is introduced, it is mostly interpreted as a stand-alone practice, neglecting both incipient conflicts and complementarities with governance practices. The BPR proposal was also weakened by the misbelief that process organization was only feasible in medium-large industrial enterprises, which relegated industrial SMEs, service firms and public organizations to the storeroom, despite the fact that re-engineering is nothing more than rethinking the way to organize an activity, and as such is applicable to all organizations. The same proponents of BPR (Hammer and Champy, 1993, ch. 13) were nonetheless aware of the profound knowledge and skills needed to complete the required changes (HPWO) and to obtain the expected results, to the point that they predicted a 50% failure rate due to a series of approximation risks that the managers and various stakeholders could have been incurred in the 19 issues examined.

The third reason does not concern diffusion as such, but rather the difficulty of measuring and interpreting elsewhere the diffusion of the lean model. It cannot be seen as a 'cloning' of the original model since it developed in a cultural, legal and institutional context differing from that of the economic-productive systems and countries that have adopted it. Thus, it should not be surprising that there are different degrees of hybridization in the applications (from the production to the administration sphere, from that of relationships with suppliers to industrial relations, and so forth), as documented by the literature on lean production case studies in the US and Europe.[18] The diffusion took place with greater progression first in the US and then later in Europe, albeit with different levels of completeness: as noted by Ichniowski *et al.* (1996), analyses should distinguish between the adoption of single innovative practices and the incidence (or extension) of the practice itself, namely, the degree of its application to the various organizational units or the workforce employed, since if adoption by the firm is via a single practice and not a group of complementary practices (bundles), and if extension is not on a significant level, the expected effect on firm performance is practically zero. The metric used in empirical surveys is not always the same, and this prevents a stringent comparison of the degree of real diffusion of new work practices among different firms operating in different economic systems (sectors and countries). For example, Coriat (2001), in reviewing the results of four European national surveys completed in the second half of the 90s (Germany, Denmark, United Kingdom and France), pointed out a number of underlying conceptual pitfalls to various changes and innovations being measured and investigated. This demonstrates the heterogeneous theoretical interpretations circulating in the old continent on the lean model, even prior to its operational level.

The fourth reason corresponds to obstacles and resistance. Despite the positive results generated by organizational innovation, in terms of reduced costs and improved quality of products and services as well as motivation, commitment and competency development of workers, the reasons for the limited and variegated diffusion of the promising model have been rightly questioned through both specific questionnaires (European Commission, 2002) and critical theoretical analyses. From the former, four major issues emerged. The first is linked to the differing intensity of competitive pressure to which firms are exposed, which affects the willingness of top management to implement a BPR process. The second issue relates to the fact that not all firms have the financial resources and expertise to address the significant costs of the changes in question. The third relates to the fact that knowledge in this area (BPR and lean organization) is poorly codified and

[17] Part of this phenomenon (though difficult to quantify) is attributable to the consulting world, ready to excavate a market as soon as the opportunity presents itself. For a critical analysis of the consulting role in respect of the needs of firm management see Kieser and Wellstein (2008).

[18] Koike (1998) in comparing the experience of three production departments operating in NUMMI and Takaoka (one of Toyota's original factories) highlights some significant differences not only in work practices, but especially in the incentive system, much more developed in the Japanese than in the American factory.

disseminated, and firms can only access it by using consultants or turning to specific organizations. The fourth and final key issue is that this type of change involves the system's hierarchical structure and the firm's governance, and thus the entire social structure as such is variously involved in the perception of risk of loss of status and professional power in a BPR operation: from managers to foremen and finally to line workers. The significance of the effects of inertia and resistance is proven by the preference of several firms, in wanting to move along the HPWO path, to invest in so-called greenfield plants, where the adoption of new designs and new organizational practices is actually higher than in brownfield plants. However, Japanese 'transplants' in Western countries, activated by Japanese multinationals operating at the forefront in using these practices, have encountered difficulties in adopting the complete system of management practices in use at their parent company in Japan (Doeringer *et al.*, 2003), largely due to the differences in the industrial relation systems between the host countries. From the theoretical criticism, a good number of indications have been advanced in the explanation of inertia in adopting organizational changes. A first explanation refers to behaviourist organizational theories (March and Simon, 1958; Cyert and March, 1963), according to which economic agents would be guided by bounded rationality in their decision-making activities and the costs to access, store, process and transmit information are not easy to ascertain under uncertainty: this may induce firms to stay with the current organization design rather than face changes that might induce significant sunk costs, unless abnormally poor performances trigger change or significant extra-profit is foreseen. A second explanation is put forward by population-ecology literature (Hannan and Freeman, 1984), emphasising that structural inertia is the outcome of the selection process tending to favour stable organizations. A third explanation lies in the evolutionary theory of change (Nelson and Winter, 1982), which views the organization as a repository of knowledge, knowledge that crystallizes in routines, as a result of cumulative processes based on past experience of problem solving activity: this operational way of working tends to generate automatically coordinated responses to specific signals from the environment, leading to lock-in effects. A forth explanation refers to the 'hold-up problem' (Menezes-Filho and Van Reenen, 2003), namely, a likely appropriation by employees of quasi-rent from investments in organizational changes in the form of higher pay since once investments have been made the process cannot easily be reversed, thereby weakening the firm's bargaining position and with the subsequent risk that these investments turn into sunk costs for the firm. The fear of running into problems of this nature could therefore be the reason why, in contexts where the collective 'voice' of employees assumes an 'adversarial' connotation, trust and cooperation among parties decreases, reducing the firm's efforts towards organizational changes. Unless failure to do so threatens survival. A fifth explanation is based on Zwick's (2002) econometric estimates, according to which organizational innovations always entail costly investments in human capital that are sunk, *i.e.*, that do not earn a return when the investment does not lead to additional productivity. Consequently, internal resistance against innovations is high when employees face a high risk of losing their investment costs, and especially when employees fear losing their jobs and expect not to be able to use the newly acquired human capital in another job. In addition, resistance is higher when the employment of lower qualified or unqualified employees is endangered because their lay-off costs are higher than those of higher qualified employees.

The quality of these theoretical arguments are not often taken into account in either designing questionnaires (which should suggest specific questions) or in explanations of why new organizational configurations are diffusing so slowly, in spite of their promising outcomes, thus preventing reliable policy prescriptions. Conversely, we must recognize that for some theorizations it is very difficult to turn concepts into empirical measures.

The awareness of the positive results of HPWO on the dynamics of productivity, but also of resistance, costs and barriers that meet their implementation, has prompted several European governments, mainly in the Centre-North, to pursue industrial policies to encourage organizational innovations across the board, simultaneously supporting a policy of industrial relations based on partnerships between firms and unions.

Aloisini (2009) provides a comparative analysis of strategies aimed at promoting workplace innovation in nine national and regional European contexts in the last few years, raising crucial issues for promoting learning across national borders in workplace development.

6. The major open questions

To fully answer the question on whether the lean organization is really more efficient and more profitable than the Taylor-Fordist organization, with more robust and incontrovertible estimates, researchers have to compete with the set of ambiguities, aporias and methodological doubts that still exist in the empirical literature. As mentioned in section 2, some studies have already attempted to synthesize the literature through a narrative review, highlighting several critical aspects that are fairly diffused in the literature. Rather than replicating a similar exercise, in the following we draw attention to a few of the relevant issues either because they have not been sufficiently explored – even in the most recent literature – or because in previous surveys some details were neglected or poorly undertaken and as such risk perpetuating an unsatisfactory way of completing further empirical researches.

6.1 Subjective versus objective measures

The evaluations of organizational design, activated work practices and industrial relations, as well as some performance measures (in case of establishments or plants), originate from interviews with business managers or workplaces, and as such reflect subjective judgments that may conflict with objective evaluations, especially in the case of performance: consider, for example, productivity, profit rate, return to assets deriving from externally recorded and audited accounts in comparison to subjective measures as reported by respondents.

There are essentially two reasons to turn to subjective measures: on the one hand, the economic character of the information collected through questionnaires, combined with information on organizational design and practices; on the other, the impossibility of observing practices (consider, for example, staff selection, very often centralized in the case of multi-site firms) or performance relating to a single-site of a multi-sited firm: in many firms, work practices and organizational design differ considerably across workplaces or sites thus suggesting that the analysis on an organizational level should always be as homogenous as possible. It would be wise, however, to also reserve some precautions in terms of objective performance measures since these are also not always unequivocally determined. Apart from (quite rare) fraudulent financial and accounting records of firm performance, it is worthwhile keeping in mind the practices of: i) bringing forward planned expenditure in good years to offset tax or for cash flow reasons; ii) delaying investments in bad years, carrying over costs in light of performance; iii) charging costs in one particular year while spreading the benefits over several years; iv) putting forward ad hoc justifications for depreciation rates.

Both cases require facing the problem of a potential measurement error in the variables relating to performance. The assumption of a random error can easily be solved in a regression context, with firm performance as the dependent variable. The case of measurement errors in work practices is different (both HR practices and organizational design): we will deal with this problem further on when examining measurement errors among independent variables.

On this issue, it would however be useful to take into account the scepticism of mainstream economic theory mistrusting the subjectivist approach because of the absence of a set metric, either a quantitative scale or, even, any universal point of origin. Of particular importance in surveys is modulating the question with respect to the real observed behaviour of individuals, since performance does not concern firm policy towards new work practices and so forth, but what has actually been implemented, what employees do (Green, 2006: 10).

Regardless of the issue of measurement error, the subjective *versus* the objective approach could be considered outdated due to the fact that the literature presents a series of demonstrations of equivalence between the two evaluations (Wall *et al*., 2004, and the bibliographical references included therein). Various surveys based on workplaces or single-sites investigate correspondence between subjective and objective measures of performance in the sub-sample of single-site firms: the unit of analysis for practices and for subjective performance thus directly corresponds from a statistical point of view. The tests provide positive and reassuring responses not only in single-site firms but also in multi-site firms where respondents are usually asked to answer – in terms of organizational practices and for the most typical site – questions in relation to performance for the company as a whole (Wall *et al*., 2004).

It would be advisable, however, to continue proving, any time the database allows it, the condition of equivalence between subjective and objective measures in the subset of sample observations referring to single-site firms.

6.2 Single rater versus multiple raters: is measurement error a significant issue?

The question of the potential measurement error in subjective evaluations is coupled with that of the reliability of a single respondent to be able to assess – as the investigation unit increases – the actual practices in place in the various departments and offices. The alternative would be the use of several evaluators (raters), one for each organizational sub-unit. However, in microeconometrics, reliability is also undermined by other sources, such as the incorrect coding of correct responses and the use of a correctly measured variable as a proxy for another theoretically valid but unobserved variable. All these doubts disappear with aggregate data because it is usually assumed that aggregation results in the cancellation of the measurement error to some extent, while the measurement errors persists in individual-level data. If this were true, then the independent variables that enter the relation between work organization and performance (WO-P hereafter) are characterized by a random error (except in special cases where x is time or a dummy variable), preventing the identification of the parameters of interest.

In these conditions, the parameters of the WO-P relation estimated with the OLS method are distorted (Cameron and Trivedi, 2005, chapter 26)[19] and thus require making use of the IV method (Instrumental Variables), with the difficult problem of finding the appropriate 'instruments', namely, passing all the validity tests of the instruments themselves and the orthogonality of the explanatory variables.[20] In the case of failure – given that the coefficients are consequently not identifiable – the researcher can limit the target testing hypothesis first on whether the effect size of the coefficients of interest are different from zero, and secondly identify the consistent bounds by reverse regressions, searching for lower and upper bounds on the values of the true slope coefficients, in order to provide the magnitude of the impact effect.

However, usually researchers simply bypass the argument by assuming (implicitly or explicitly) that as the unit size increases, the process of filling out the questionnaire involves more than one respondent. We would encourage future survey designers to improve their efforts in this direction, explicitly requesting that each section of the questionnaire be filled out – under the supervision of a senior manager – by *key informants* and thus pursuing, *ex-ante*, greater precision and objectivity of the data gathered.

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[19] The extent and direction of the distortion cannot be defined *a priori* since it depends also, in cases of cross-sectional data and panel data, on the structure of the model and whether the model is linear or not - in the case when the model itself presents the intercept, and if the stochastic regressors are more than one. A comprehensive discussion of this topic can be found in Cameron and Trivedi, 2005, pp. 899-911.

[20] From a statistical point of view, it would be possible to use the standardized regression coefficients technique to take account of the measurement error in the independent variables. However, as is evident from the previous note, the problems are not that simple. See in this regard, the debate between Gerhardt el al. (2000a, 2000b) and Huselid and Becker (2000).

6.3 From random samples to correct estimates of the phenomenon in the population

Sample surveys are usually assumed to originate from a simple random sample, while an almost universal practice is the stratification of the sample of units, commonly based on size-bands and industrial activity categories. It is well known that a simple random sample of units (firm or workplace) occurs only within each cell of the sampling matrix, while sampling fractions usually increase with employment size, giving rise to a very large range of sampling probabilities, namely, varying decreasingly along with size. If no weights are applied to the data, the results (descriptive analysis by means or proportions; bivariate relationships by cross-tabulations; multivariate relationships by regression) are in no way representative of the population of the target units.[21] As concerns the multivariate analysis, both the model coefficients and the precision of the explanatory variables (namely, the standard error) are distorted.[22] The assertion of some researchers to include size and industry variables (the two design sample variables) among the control variables of a model to temperate the sampling distortions is not always correct, since these control variables usually 'control' for some theoretical arguments,[23] or for some characteristics of the organizational units that vary by size and by sector.

6.4 The question of minimum firm size

Assuming a link between combinations (bundles) of HPWPs and improved economic performance, one can speculate whether this also applies to small firms, usually left out of the sample survey based on the argument that organization in small firms takes on very informal connotations and as such are difficult to identify and quantify. Wisdom has it that this generalization should be made with great prudence, and the results should preferably be limited to the sample's matrix of reference (by size and sector).

Should this not be the case, one could argue that firm size is therefore a 'contingent' factor (a typical argument of 'contingency theories'). Conversely, one could counter argue that the effectiveness of a series of work practices could depend on the fact that 'other' managerial practices must be active, which in small organizations may not be implementable. If so, then the discourse should not be so much about contingent factors, but about the impossibility of extending the bundles of practices 'practiced'. Unless the other practices are 'specific' to small firms, in which case the presence of 'different' factors, affecting performance, would allow maintaining the 'diversity' category alive, which coupled with 'selection' would give substance to the 'biological' view of the enterprise system, with adaptation, survival and progress.

6.5 Different characterizations of the constructs underlying survey questionnaires

One aspect to be carefully considered in using survey databases is the different constructs that underlie questionnaires designed to identify organizational unit policies on organizational design and human resources with respect to questionnaires aimed at identifying what actually happens (practice) in a given

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[21] If, for sampling reasons, an over-sampling of some sectors has taken place, the weight variable has to be coherently adjusted; a similar adjustment has to be made when a differential non-response occurs among size and sector strata.

[22] See, for a detailed analysis, the '1998 Workplace Employee Relations Survey' (in the UK), Purdon and Pickering (2001).

[23] For example, in the absence of more meaningful indicators, the sector type variable (dichotomous) is frequently used to control for different technological opportunities that technical progress historically offers, ascribable on one hand to the lagged basic research functions, very often of public valence, and on the other, to rules and institutional systems (Dosi, 1997, Malerba 2002), while the dimensional type is sometimes used to check two classic Schumpeterian propositions, the first emphasizes innovation as a result of the continuing battle between individual entrepreneurs (thus small firms) in proposing new solutions to specific problems (Schumpeter Mark I), while the second refers to the idea of the need for a systematic study of innovation through R&D that is better achieved (for reasons of scale and the resources necessary for the protection of patents) within large oligopolistic firms that invest a quota of their turnover in investment in R&D (Schumpeter Mark II).

organizational unit. This may be interpreted as a semantic question but it is not. The first characterization tends to depict the 'project' of change, which may only be partially implemented; this could be relevant for studies of adoptions of new practices, where it would be very useful to identify the degree of implementation of the project and any resistance to change. The second characterization has the advantage of being appropriate for the WO-P relation, since it tends to measure behaviours and organizational traits that have the most direct impact on outcomes. Moreover, this is likely to incorporate less distortion related to the respondent's perception since the questions tend towards measuring the phenomenon investigated. In the presence of indicators (items, practices or bundles of practices) that 'also' incorporate some distortion ascribable to the subjective perceptions of the respondent, in the WO-P relation the researcher must specify models with stochastic regressors, provided that the distortion is of a random-type (on these aspects, see section 6.2).

6.6 Ways of combining single practices to represent the multi-dimensional nature of HPWO: the identifying bundles

A crucial aspect of the research process concerns the effort of turning concepts into workable, valid and reliable survey questions. It is not uncommon in numerous surveys to see single respondents from each organizational unit being asked to provide a single numerical rating that describes each practice on a unit-wide basis. Broad and profound concepts cannot be reliably measured with a single question (or single item) asking whether or not a given practice is implemented, or a given management tool is used: a series of specific questions are required on the components or the dimensions of a given practice. Naturally, the end user of a survey is constrained by the survey designer's choices upstream of the process.

As an example, some questionnaires ask respondents whether or not there is a 'joint consultative committee' concerned with consultation in their organizational unit. Other questionnaires go further, asking, for example, how often meetings are held (indicating a rising number, for a given period), what proportion of meetings were attended by senior management (again, indicating a rising percentage, sometimes in size-bands) and what issues had been discussed (again, listing a varying number of issues). Unfortunately, however, the metric used changes from questionnaire to questionnaire, with the risk of providing a different empirical picture even if apparently under the same or similar construct.

The dimensions of the various organizational practices under investigation are declinated and measured in a similar way.

There are mainly two ways to combine individual practices to represent a multi-dimensional phenomenon. However, before proceeding in this direction, an important preliminarily step (largely neglected) consists in checking the 'internal consistency' between the items forming a single practice or a bundle of practices: this can be achieved by estimating Cronbach's α coefficient, which indirectly shows the degree to which a set of items or practices measure a single unidimensional latent construct (that is, if we are measuring the *same things*).

a) From items to single practices

To deal with a multidimensional phenomenon, a relatively frequently used method (see, for example, Osterman, 1994; MacDuffie, 1995) is the 'additive' index[24], which summarizes several items, generally

[24] An 'additive' index is of course subject to hypotheses that may seem limited, such as the equivalence and linearity of each dimension in relation to each of the others.

expressed in terms of dichotomy dummies, forming a scalar variable that depicts a given single practice for each single organizational unit. However, a factor analysis can also be used.

b) From a single practice to a set (bundle) of practices

Exploratory or confirmatory factor analyses are the predominant methods in use to form orthogonal and unidimensional factors. A bundle refers to a systematic interrelationship (that is, mutually reinforcing the effects of multiple elements) among the variables under investigation. It is worthwhile emphasizing that bundles in themselves are thus already conceptualized as complementary among the elements that compose them; in other words, complementarity is 'internal' to the various practices that form the bundle in an implicit (in the case of the sum of the items) or explicit form (in case of factor analysis). Instead, when looking for interaction between bundles, complementarity becomes explicit and 'external', and is sought using the ''multiplier' form of the same, verifying whether the effect of the impact is more or less proportional.

A final word has to be reserved for the *nature* of a bundle. Two examples: as far as work practices are concerned, the concept of a bundle, as opposed to individual practices, should refer to the daily activities of employees, indicating whether these: (a) reinforce motivation or not, (b) induce the development of workforce competences or not, (c) stimulate creativity and problem solving or not, (d) encourage the assumption of responsibilities or not, and so forth, also in relation to collective and incentives schemes, merit rating, tenure-wage earning profile, on and off-the-job training, cooperative attitude, long versus short duration of employee contract.

Organizational changes need to be proceeded with in the same way: (i) job design (that could be broadly or narrowly demarcated); (ii) few broad *versus* several narrow grade classifications; (iii) design of the single role or single job within a setting (work positions within an autonomous or semi-autonomous group *versus* individual work position along a moving assembly line chain or in a work unit); (iv) design of the hierarchical structure of operational coordination mechanisms (which can be lean or high); (v) design of internal aggregation of activity units (which can be based on processes or functions); (vi) organizational design based on the just-in-time logic (justified by the maximization of efforts towards zero defects and developing the problem solving capabilities of human resources) *versus* buffers (justified by the risk of disruptions to high-volume productions and a certain level of quality defects).

In this way, we can identify and deal with the dual nature of bundles, i.e., innovative and counterfactual. In doing so, a researcher is in a position to question whether a complementarity relation between two or more bundles exists, driven by the idea that logical and operational coherency is critical for the identification of both production system models and their efficiency.

Similar arguments have to be extended to industrial relations (participative *versus* adversarial) and ICT (new *versus* old technologies), to the extent that they are dealt with in terms of bundles, and the interest is in searching for the complementarity quadrilateral of the new organizational configuration of the firm, the renowned HPWO (High Performance Work Organization).

6.7 Adoption of changes: altogether simultaneously or a sequence of adoptions? [25]

The clustering of practices finds empirical and theoretical support from the review developed above. However, whether practices that form a cluster, identified at the time of a survey, reflect the adoption of practices simultaneously and specifically chosen or whether they are simply steps along a 'unique' sequential process of adoption is still an open and relevant question. On the one hand, the existence of different initial

[25] I thank Annalisa Cristini, colleague and co-author of several papers, for this idea.

conditions, or different constraints or even the different worldviews of managers, could induce each firm to start the process of change by adopting different practices from other firms, so that the bundles identified at a point in time (precisely, at the time of the survey) differ between firms or groups of firms. On the other hand, one might imagine that the path along which adoption starts and is completed is unique, but each firm, for a number of reasons – for instance, due to the crises favouring significant non-simultaneous changes – starts the adoption process at different times. The cross-sectional picture that emerges would be observationally equivalent to the previous picture but would in fact reflect a different adoption process. Unfortunately, the temporal dimension of studies on workplace practices typically suffer from poor data since no information on the time of adoption of each practice is usually available. Freeman *et al.*'s (2000) is an exception, since they know the number of years a practice has been in use. They find that the most diffused practices are those that have been in use for a longer period, suggesting that a sequential ordering of the practices may exist so that some practices form the basis for other subsequent (and probably more advanced) practices. This is equivalent to the diagonal of Gantt's diagram, as mentioned in the introduction section.

Using cross-section data, some information on the 'sequential ordering' of practices may be obtained by recording the inter-correlation among practices. Let *a*, *b* and *c* be three practices in decreasing order of frequency, then counting, among firms that have adopted practice *a*, those that have adopted practice *b* and those have adopted practice *c*; by repeating the count for all practices a matrix of data is obtained (Freeman *et al*., 2000). If the order of frequency reflects the (unobserved) order of adoption, and this is unique, then we expect that all firms that have adopted practice *b* have already adopted practice *a*, where a lesser percentage has already adopted practice *c*; if this happens exactly, all numbers above the diagonal should be 100 and those below should be less than 100 and decreasing.

All this complicates the framework of analysis: we imagine that the productivity growth of enterprises requires not only investments in ICT but also investments in complementary organizational changes and that these changes not only see sequential-type adoption, but also time-lagged returns (due to the learning time of new human resource roles, which according to estimates by Bauer (2003) and Basu e*t al.* (2004) may well go beyond 4-5 years). It follows that the comparison of two firms (or sectors), at a given point in time, may reveal that – for the same investment in ICT – a firm shows an acceleration of its TFP and another a deceleration for the simple fact that the former could have made investments in complementary organizational capital in some previous period,[26] or because the latter has violated the sequential adoption of new practices.

6.8 The temporal and staggered lags of effects[27]

We expect that investments in general-purpose ICT are a *relatively* low cost and an easy change to make whereas other changes, specifically those relating to organizational changes and new work practices, are both costlier and slower to activate; another argument holds that some time needs to elapse for new workplace systems to show their entire effect on productivity: employees need to acquire the necessary competencies, become familiar with the new work methods, get used to the new role, responsibilities and decision-making

[26] This is precisely the situation that emerges in the comparison between the US and UK in the work of Basu *et al.* (2004), who ask themselves whether ICTs are able to explain why the US has accelerated in its TFP while the UK - which has the same rate of investment in ICT as the US - has decelerated. The answer lies in the different rate of investments in organizational change in the US and the UK and the time lag. This is because the US had already begun to invest in ICT and organizational changes in the 80s, while the UK only joined the rhythm of investment in ICT in the 90s. Moreover, in this latter period, the data rightly shows the divergent TFP dynamics of the two countries.

[27] According to some evidence, the diachronic nature of firm reorganization implies that practices are adopted sequentially, stepping from those most largely diffused and easy to adopt to those more difficult and costly to implement (Freeman *et al.*, 2000). If this is the case, and if it is possible to identify a single, although imperfect, reorganization meter, then the set of practices in existence in a firm at a point in time also indicates the firm's advancement in the reorganization process itself.

before performing in the new organizational environment. Thus, it is possible that complementarity between contemporaneous ICT and organizational changes does not emerge or may even be negative in some cases, signalling, for example, that the process of adjustment has not yet be completed or that the adjustment costs outweigh the gains. Usually, where investigations can rely on panel data, a considerable time lag between adoption and productivity results is observed. The Danish Ministry of Business and Industry (1996) documents that the implementation of both ICT investments and organizational changes induce a positive and rising impact on productivity from the fourth year after adoption; Brynjolfsson *et* al. (2002) find that the performance effect of the interacted ICT-reorganization term rises appreciably in the third year. With regard to bundles of workplace practices, the time lag appears to be even longer: Kato and Morishima (2002) find that complementary participatory human resource management practices lead to a significant increase in productivity only seven years after their introduction; similarly, Bauer (2003) demonstrates that the productivity effect of implementing high performance workplace practices rises over time and has a positive impact on labour efficiency only in the long run (from three to four years).

Moreover, adjustment costs may depend on the extent of reorganization: a situation where the workplace is undergoing extensive renovation (many dimensions are being changed) differs considerably from a situation where only a few changes are introduced, although the sign of the difference is not clear. For example, one expects that where many changes are being undertaken, potential complementarity gains are higher[28] although employees, in this case, may need more time to learn and adapt to the new environment or may even resist the change, thereby reducing the benefits of restructuring.

7. Final remarks

Porter's (1985) distinction between two generic firm strategies, cost minimization and innovative/quality strategies, attributing the former to a Taylorist system and the latter to lean production – in this way fostering a contingent view of organizational forms – appears to be obsolete and inadequate in understanding market processes and the thwarting forces that operate in market economies. The former strategy, which in the first instance points to a reduction of monetary labour costs through outsourcing, currency devaluation or atypical contracts, gives rise to effects that are initially positive, but after a certain point quickly diminish over time: this is a short run and transient strategy, not able to procure a sustainable competitive advantage for the firm in the medium-long run. Nor is the dispute between those who think the non-Taylorist organization is a best-practice model - regardless of how it is constituted - and those who view its relevance as dependent on the organization's strategy and context, very useful since it does not make any distinction – as occurs instead in chemistry – between the discovery of new 'basic elements' (such as learning and knowledge production) and the different combinative possibilities (Grandori, 2005: 58). In fact, a new organizational performance practice or a new performance bundle of practices is the result not only of different 'ingredients' (item in the former, practice in the latter) but also of the different weights of each ingredient. Hence, the employer and/or manager has two levers: ingredients and their indefinable combination to pursue efficiency and performance. For example, if one considers the impact effect on performance by a bundle of three work practices, measured by regression coefficients (main effects and interactive effects), these refer to the mean value of the distribution of independent variables: one obtains different results when diminishing or increasing the mean value of one or more 'ingredients', or enlarging (to four practices) or restricting (to two practices) the bundle.

In other words, the latter dispute does not take account of the fact that the new organizational performance configuration has to be built on performance stemming from 'within the firm', and from factors

[28] Milgrom and Roberts (1990, p. 513) cite various works according to which "the full benefits are achieved only by an ultimately radical restructuring".

of a dynamic nature such as 'social capabilities' (Abramowitz, 1989), primarily learning and knowledge creation, which are not easily transferable: these are internal primary sources of innovation that require – to become powerful – appropriate workplace design, specific new work practices and organizational well-being (namely, good and trusting industrial relations) that empirical research has recently identified and documented as improving firm performance, competences development and innovations.

Recognizing as a stylized fact that lean production performs better than the traditional form does not mean that we are facing a *new* one-best way (which is a non-sense category): the persistent heterogeneity across firms, and even more, across countries, in their abilities to develop, imitate and adopt organizational and technological innovations is an equally robust stylized fact, which leads to predictions of – irrespective of old or new forms of organizing – interfirm heterogeneity in innovative patterns, asymmetries in innovative performance across firms, possible path-dependency and lock-in phenomena.

From an analytical perspective, the fact that international research has not yet endorsed well-established complementarities among organizational design, new work practices, industrial relations and new technologies across firms, seems to keep the idea of 'contingencies' alive, namely, there is not 'one-best way' *to organize* a flexible firm. This paper has documented that the incomplete and imperfect implementation of the new performance configuration may be due to several reasons, quite different when compared to those used by contingentists. If so, then several contingent elements may be viewed as transient, or as changeable elements belonging to different layers of organization building.

The new model clearly involves fundamental shifts with respect to the traditional firm organization: the turning point may be glimpsed in leveraging the participatory circuits of knowledge development, through which tacit knowledge becomes explicit and codified, and thereafter incorporated into new products, new services and new ways of working (Nonaka and Takeuchi, 1995; Nooteboom, 2000). Yet, these developments cannot happen in any undifferentiated work environment: Kenney and Forida (1993) highlight that lean production (even in the meaning of its various implications) has precisely the characteristic of mobilizing the intelligence of a larger number of workers involved in the enterprise, creating a new and qualitatively better synthesis between manual work and mental work, compared to the traditional model. Intelligence that is all the more necessary precisely because it is required of both individuals and production organizations in a context of constant change, high volatility and substantial uncertainty: namely, *cognitive and communicative* activity (Cainarca and Zollo, 2001), or rather, a distinctive competence in the sphere of analysis and interpretations of economic production facts (flow of new products, improvement of old ones, and more efficient ways to produce them). Lester and Piore (2004) note in this regard how 'analytical processes' are at work when the alternative outcomes are well understood and can be clearly defined and distinguished from each other, while the 'interpretative processes' are activated when possible outcomes are not known, i.e., when the task is precisely to create the results and determine their properties. The two processes are somehow opposed to each other, but the distinctive competence is in the integration of the two processes, namely, thinking of them independently but managing them simultaneously. The organizational structure that best stimulates and assists in this integration of the two processes is a flexible form of lean production, which leads to the *learning organization*, inasmuch as individuals, but also individual production units within the organization, relate to each other in a more complex but also more fruitful way than is possible through the classical mechanism of hierarchy (in the case of relations with suppliers and customers) and the price mechanism.

All this appears to be in perfect harmony with the thought of Grandori (2005), who strongly supports the emerging movement to restitute to organization design the central position it deserves, at the same time renewing the approach to it. Lingering on a 'contingency' approach has prevented organization theory not only from readily grasping the structural capacity of the new 'lean production' organizational form with respect to the Taylor-Fordist, but also from contributing to developing tools for design in a creative, generative, problem-solving, architectural sense (*ibidem*, p.52), and the emerging new theory of

'organizational combinations', which recognizes the existence of some 'basic elements' (governance and coordination mechanisms) that – as in chemistry – can give rise to different (exterior) forms mainly due to different combinative possibilities (*ibidem*, p. 58).

In order to give substance to these concepts, and in an attempt to offer food for thought to sceptical scholars, we retain as essential a potent research project by international economic organizations such as OECD, EU institutions, etc., similar for example to OECD's (2011) P.I.A.A.C. (Programme for the International Assessment of Adult Competencies)[29], directed at identifying and measuring, in the spirit of the Green Book published by the European Commission (1997) ('Partnership for a new work organization'), the internal characteristics of firms making use of an international sample of organizations. This in order to give analysts, scholars and institutions the possibility to overcome most or possibly all the weaknesses, approximations and compromises in the actual state of the art of empirical research, allowing economic theory to offer to economic agents, social parties and policy makers robust, correct and complete information on the causalities of firm performance and to point out the explanation component that is ascribable to new work organization.

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