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Abstract

Using multilevel mixed effects ordered logistic models, this paper conducts an original investigation of the new management as a technology approach for all EU nations in a framework that explicitly recognizes worker representation while incorporating the notion of affective commitment. It is reported that that low worker commitment is unlikely to be found in establishments with better management practices and that, controlling for management practices and worker representation, the hypothesis that financial and productivity performance is superior in establishments *without* worker representation is not rejected by the data. For establishments *with* worker representation, the works council-only variant is seemingly the most favorable regime for financial performance, although this does not carry over to the labor productivity outcome. On net, however, the evidence suggests that the selected management practices are likely to be favorable to performance in plants with and without formal workplace representation. Greater worker commitment is strongly associated with improved labor productivity. Moreover, in this case there is seemingly no difference between works council-only representation and no representation at all. Overall, although the results for workplace representation and the financial situation are mixed, it is the case that greater commitment trumps any negative influence of worker representation type.

JEL-Codes: D220, J530, J500, L200, M540.

Keywords: management as a technology, human resource management, worker commitment worker representation, labor productivity, financial performance.

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1 Introduction

A distinctive body of research on the management of human resources has adopted a management technology approach, seeing at least some aspects of HRM as a technology or *best practice*, whose incorporation would improve the technology of the typical firm. That all firms do not adopt these best practices has been laid at the door of weak competition, poor governance in family-run businesses, labor market regulation, and, latterly (for the U.S.) learning spillovers and unionization (Bloom and Van Reenen, 2007, 2010, 2011; Bloom et al., 2019). By contrast, under a contingent management scenario, observed heterogeneity in the adoption of different practices is attributed not to inefficiencies but rather to explicit strategic choices of firms on the basis of the different environments that they face.

Using an innovative survey methodology, the management as a technology argument has been used to analyze various aspects of firm performance (productivity, profitability, innovation, survival, and growth) in 732 medium-sized firms in four countries (the United States, France, Germany, and the United Kingdom), 35,000 U.S. manufacturing plants in 2010 and 2015, and in samples of medium-sized manufacturing firms in up to 35 nations. In the present treatment, we provide establishment data on all EU member states using an approximation to these surveys of structured management practices that we construct from the 2013 European Company Survey (ECS). Apart from providing information on a fuller range of European nations – some 16/17 more than the existing management practices literature – our goal is to link this new literature with two familiar topics encountered in industrial relations and labor economics, namely the role of worker representation/voice and worker commitment.

We begin with a brief review of conventional models of collective voice, affective commitment, and employee involvement/high performance works practices, before turning to the corresponding empirical evidence. The latter examines the impact of voice and loyalty as filtered through human resource practices. It also squarely addresses the new literature on structured management practices, their determinants and association with establishment performance. The next step is the modeling exercise itself. We provide a framework of multilevel mixed effects ordered logistic models that lead us to propose testing a sequence of specific conditional correlations or associations in the data. These are (a) the association between management practices and performance outcomes; (b) the role of management practices in securing the commitment, or otherwise, of the workforce; (c) the association between management practices and performance to ascertain the likely *direct* effects of type of workplace representation; and (d) the connection between worker commitment and performance, again controlling for workplace representation. Prior to implementing these tests, two descriptive sections of the paper focus in turn on measurement of our pivotal variables, and offer descriptive statistics showing how our key construct – structured management practices – varies across countries, establishments, and worker representation types. Detailed empirical findings are then presented, followed by some robustness checks.

To anticipate our findings, as do Bloom, Van Reenen and colleagues we find solid support for the management as a technology model. However, our distinctive contribution has to do with the potential contribution of worker commitment and the role of worker representation. As expected, low worker commitment is unlikely to be found in establishments with better management practices; that is, the association between the overall index of management practices and worker motivation is positive and well determined. Controlling for management practices and worker representation, the hypothesis that financial and productivity performance is superior in establishments *without* worker representation is not rejected by the data. For establishments *with* worker representation, the works council-only variant is seemingly the most favorable regime for financial performance, although this does not carry over to the labor productivity outcome. On net, however, the evidence suggests that the selected management practices are likely to be favorable to performance in establishments both with and without formal workplace representation. Returning to an employee's identification with the organization, greater worker commitment is strongly associated with improved labor productivity. Moreover, in this case there is seemingly no difference between works council-only representation and no representation at all. Although the results for workplace representation and the financial situation are mixed, overall it is the case that greater commitment trumps any negative influence of worker representation type.

2 Collective Voice, High Performance Works Practices, and Worker Commitment

The arguments favoring worker representation (in unions and works councils) and employee involvement are closely linked. Thus, the scope for employee involvement to improve performance rests on many of the same arguments used in the collective voice model of unions (Freeman and Medoff, 1984). Further, the innovative work practices identified in the employee involvement literature may offer the prospect of piercing the veil of the collective voice model which is opaque on mechanisms. In turn, the notion of worker commitment has been linked to innovative work practices and to collective voice given the exit, voice, and loyalty heritage of that model (see Hirschman, 1970).

2.1 Collective Voice

Historically the centerpiece of collective voice is the *union* role in providing information in labor markets characterized by continuity rather than spot market contracting because of on-the-job job skills specific to the firm and the costs attaching to worker mobility and labor turnover. The voice mechanism is viewed as superior to reliance on quit (i.e. exit) behavior as a source of information on worker preferences because of the non-rival consumption of shared working conditions such as safety, line speeds, and grievance procedures. A second public goods dimension of the workplace favoring the expression of collective voice stems from the nature of the provision of effort where there are significant complementarities in worker effort inputs. Unions, so the argument runs, collect information about the preferences of all workers, and aggregate them to determine the social demand for such public goods and enabling the firm to select a more efficient mix of personnel policies. The other main aspect of collective voice is governance which refers to the policing or monitoring of incomplete employment contracts. Such arrangements should help improve the flow of information between the two sides and

facilitate the negotiation and administration of long-term contracts. For example, the presence of a union specializing in information about the contract and in the representation of workers can prevent employers from engaging in opportunistic behaviour, and in protecting workers unions may generate worker cooperation.

But the threat of credible punishment by the union also depends on power, and union power involves a hold-up problem of its own. The standard collective voice model treats the exertion of bargaining power and the expression of collective voice as distinct and offsetting facets of unionism – hence the reference to the 'two faces' of unionism in Freeman and Medoff (1984: 5). Recognition of bargaining power is integral to the main theoretical justification for *works councils* in the model offered by one of the architects of union voice (Freeman and Lazear, 1995). The institution of the works council offers information exchange, consultation, and participation rights. Its information rights can help verify management claims as to the state of nature. Consultation allows new solutions to production and other problems by reason of the non-overlapping information sets of the two sides and the creativity of discussion. Participation increases provide workers with more job security, encouraging then to take a longer-run view of the firm and it prospects. In each case the prospect is for an increase in the joint surplus. The problem is that the very factors that cause the surplus to rise also threaten a reduction in profitability because workers may be expected to demand too much power and involvement as their share continues to rise after the joint surplus has peaked. Employers will duly either oppose works councils or vest them with too little power.

Despite its extensive powers relative to its counterparts in most other countries, it is precisely at this point that the German works council commends itself to the authors: first, because German works councils cannot strike; and, second, because they also cannot formally engage in bargaining over wages unless expressly authorized to do so under the relevant regional or sectoral bargaining agreement. It is in this sense that Freeman and Lazear speak of a potential decoupling of the factors that determine the size of the surplus from those that determine its distribution. Left open is the issue of whether there is a sufficient decoupling in practice. Thus, even if the works council is an exemplary collective voice institution, the theory does not provide an unambiguous answer as to its consequences.[1]

2.2 Employee Involvement/High Performance Work Practices

[1] It has been found that where a works council is embedded in a collective bargaining agreement the control exerted by the union (and the employers' federation) can serve to dissipate distributional squabbles. Although there is a good measure of support for the *external* collective agreement case in Germany, the related issue of local union presence is more controversial, with one recent multi-country study in particular suggesting that union dominated works councils not only experience greater strike activity than their counterparts with minority union membership, but also more strikes than establishments with union workplace representation where union members are in a minority (Addison and Teixeira, 2019). Examination of the union-works council nexus is but one aspect of there being different 'types' of works councils. The latter issue extends well beyond there being dissonant works councils (Addison et al., 2020) to encompass the covariation between works councils (or for that matter union representation) and innovative work practices, on which more below.

The starting point of the employee involvement-high performance work practices model is the notion that "workplace innovations change the production function in such a way as to increase the productivity of a firm's inputs, in particular labor" (Capelli and Neumark, 2001: 739). The basic premise is by now familiar: workers have important private information and valuable insights into how to improve their jobs. There is therefore scope for beneficial trades once workers are trained and presented with better opportunities to exercise their skills through job redesign, decreased supervision, and involvement in decision making, and motivated to contribute through productivity bonuses (Handel and Levine, 2001: 2).

Employee involvement and high performance work practices achieve traction by encouraging workers to work harder, to work smarter, and by inducing structural changes that improve firm performance. Workers are presumed to work harder by reason of their enjoying work more when the job is interesting and where it provides feedback and rewards (job enrichment) and participation. They are also considered to work smarter because of the distinct input of the worker in efficient job design. For their part, structural elements enter because of cross training and flexible job assignment; decentralized decision making to self-managed teams; and training in problem solving and computer skills. This latter argument sees innovative work practices as spawning other changes that improve productivity independent of their effects on motivation (Ichniowski et al., 1996), and is more in the spirit of the management as a technology position (see below).[2]

Overall, there are theoretical grounds for supposing that both collective voice and employee involvement-high performance work practices can improve the productivity of the workplace. Indeed, some observers profess to see little difference in the arguments for workplace representation and these practices when the industrial relations system offers some means of decoupling production from distribution issues. Yet others have argued that that traditional workplace representation through unions is important to the success of innovative work practices by providing greater assurance that a serious hearing will be given to employees' suggestions, or by virtue of greater union access to higher levels of management. In any event, study of the effect of innovative work practices upon firm performance would appear to be closely bound up with the worker representation issue.

2.3 Worker Commitment

The final strand of this theoretical backdrop refers to the concept of *affective commitment* to an organization, namely to the strength of an employee's identification with and involvement in the organization in which he/she works. Identity is to be viewed as an important supplement to monetary compensation. Here we should note that despite the generally favorable results of *incentive pay* on productivity reported in the human

[2] The structural element as described by Ichniowski et al. (1996: 301-302) reflects such factors as cross training and flexible job assignment that can reduce the cost of absenteeism; decentralized decision making to self-managed teams, permitting a reduction in line management while benefiting communication; and training in problem solving and computer skills that can increase the benefits of new information technologies.

resource management literature (see the review of 19 econometric studies in panels B and C of Table 3.1 in Bloom and Van Reenen, 2011b) monetary compensation alone can be both costly and ineffective (Prendergast, 1999; Gibbons, 1998). Distortions can arise from measurement period, gaming the system, and workers' social preferences.

The basis of affective commitment is once again the principal agent model and the separation of ownership and control in organizations with delegated decision making. In the agency model of Akerlof and Kranton (2005) there are clear advantages to inculcating a sense of identity and attachment to an organization among its employees. In particular, the employer principal has an interest in inducing the employee agent to take an action that is more costly (i.e. involves more effort) than another to that agent in circumstances where the principal cannot observe the action taken by the agent and where it is not possible to infer that action from an observation of the agent's output. (A formalization of the model is given in section 4.) The problem for the organization resides in designing a contract that not only resolves information asymmetries by improvements in organizational communication or employee involvement that yield better informed choices and higher productivity but *also* incentivizes the agent to choose the costlier action either by increasing the payment for the action or by reducing its costs. Akerlof and Kranton argue that employee utility is a function of the employee's identity and that identity can also be influenced by the practices of the organization, investments that lead the employee to consider himself/herself as an *insider* as opposed to an *outsider*. Insiders work in the organization's interest since if they were to deviate from that course of action they would sacrifice utility. Returning to the two effort scenarios mentioned earlier, if the firm can inculcate organizational citizenship this will lower the cost of effort and reduce the wage needed to stimulate choice of the high effort outcome. The human resource practices viewed as central to this end are effective organizational information and communication, organizational participation and involvement, and organizational trust.

Viewed alongside the foregoing, the management as a technology approach is at first blush rather spare. Thus, to the extent that it recognizes formal workplace representation, this would seem to be as a constraint rather than a potentially positive influence. And while clearly influenced by the human resource management literature – most notably that dealing with incentives and work organization – their measurement is guided more by the economics of management than human resource management theory. Similarly, although the new approach recognizes many pro-worker features of the firm, such as more generous childcare subsidies and better work-life balance indicators, are positively related with better management, it takes the position that these are not associated with performance conditional on management. It is also the case that human resource management scores (see below) for rewarding good performance fall well below those for fixing/firing underperformers in almost all countries examined (see Bloom et al., 2009).

Finally, there is also a clear difference in approach from personnel economics which sees every firm as adopting its own best practices given the circumstances that it faces; that is, where all management practices are to be seen as contingent on a firm's environment. There is recognition of contingent management (e.g. where different firms specialize in different management practices), so that the two approaches are not mutually exclusive,

but emphatically contingency is not the whole story given the empirical regularity of better managed firms earning higher profits and growing faster than their less well managed counterparts. Rather, certain aspects of human resource management are regarded as a technology or best practice, such that their adoption would improve productivity in a typical firm. The explanation of the considerable variation in management practices across firms (and nations) and hence inefficiencies, is attributed to product market competition, or lack thereof, labor market regulation, ownership considerations, the presence of foreign multinationals, education of the labor force and management, technological diffusion/learning spillovers, and the business environment. *Vulgo*: many aspects of management style are not contingent.

3 The Empirical Evidence on Firm Performance from the Perspective of the Foregoing Models

We next review the empirical evidence on the impact of collective voice and affective commitment on performance *in association with human resource practices*, followed by the investigation of the role of management practices through the lens of management as a technology. But we begin by noting the key measurement contribution of the new literature, namely the survey methodology used to obtain a structured incentives index of the adoption of advanced management practices.

3.1 On the Measurement of Management Best Practices

As described in Bloom and Van Reenen (2007), the evaluation tool defines and scores some 18 management practices from 1 (worst practice) to 5 (best practice). (In econometric specification, the individual scores are converted from the one to five scale to *z*-scores; the unweighted average across *z*-scores serving as the main measure of overall management practice.) The practices themselves are grouped into three main areas covering monitoring, targets, and incentives.[3] The monitoring component seeks to assess how well companies track production, and are able to build upon this as a basis for continuous improvement, as well as the application of sanctions/rewards. Targeting focuses on the type, functionality, transparency, range and connectivity of performance indicators. That part of the survey dealing with incentives issues concerns promotion practices, pay and bonuses, the treatment of star performers, and the firing/fixing of bad performers.[4]

Scoring in this interview-based evaluation tool, known as the World Management Survey (WMS), proceeds on the basis of open questions and thence on the interviewer's evaluation of the firm's actual practices. That is, open questions are targeted at actual practices and examples and continue until the interviewer is able to make a determination of the firm's typical practices based on these examples. The sampling frame of the WMS

[3] Four with the inclusion of shop floor operations practices covering modern manufacturing processes, the documentation of improvements in such practices, and their rationale.

[4] For the closest comparators of these practices in the human resource management literature, see Ichniowski et al. (1997) and, from the perspective of labor economics, Black and Lynch (2001). See also Pfeffer (1998).

contained data on 732 randomly selected medium-sized firms in 4 countries in 2004: the United States, France, Germany, and the United Kingdom. The WMS has been administered in several waves since then, most recently in 2014. The final sample includes 34 countries and some 11, 383 firms.[5]

3.2 Union Impact

The literature dealing with union effects of firm performance is vast and this is no less true of the literature on work organization and how to reform it. But studies actively seeking to link the two areas are sparse. In one of the earliest such studies, Cooke (1994) examined whether unionism positively or negatively influenced the effectiveness of employee participation programs (the presence or otherwise of team working) and group-based incentives (profit-sharing or gain-sharing plans) in a sample of 841 Michigan manufacturing firms. These dichotomous human resource practices are interacted separately and jointly with the union status of the firm. Cooke's performance measure is the net differential gain in value added per employee, obtained by subtracting the estimated differential cost of labor from the estimated differential in value added per employee. He reports that performance is 13 percent higher in unionized plants without either employee involvement or incentive pay than in comparable non-union firms. The introduction of team working raises this differential to 35 percent but does nothing to help the innovating non-union firm's performance. Rather it is group incentive pay that has a larger effect on efficiency in non-union firms either in the absence of teamwork or especially in its presence. Although necessarily tentative, the findings of this study provide a much rosier picture of union impact than earlier (U.S.) research into this topic (Addison and Hirsch, 1989).

In the second unions-and-workplace-practices study identified here, Black and Lynch (2001) estimate production functions for a large, nationally representative cross section of U.S. manufacturing businesses (the Educational Quality of the Workforce National Employers Survey/EQW-NES) in 1993, which data were linked to longitudinal Census data for 1987-93 (the Census Longitudinal Research Database/LRD). The authors identify six high performance work systems (TQM, benchmarking, proportion of workers in self-managed teams, number of employees per supervisor, and the number of employees in training), two types of profit sharing (for management and production workers), unionization, and the proportion of workers meeting regularly in groups. The authors use a two-stage procedure that first involved estimation of a fixed time-invariant firm effect – their measure of productivity – for each establishment using data on time-varying factors, and then regressed these firm fixed effects on all the time invariant factors.[6]

[5] Observe that a major new closed-question mandatory survey of structured management practices, the Management and Organizational Practices survey (MOPS), was fielded for the U.S. in 2011 and 2016 as a supplement to the 2015 and 2017 Annual Survey of Manufactures. The survey design containing some 16 management questions was based on the WMS and like that survey is constructed on recognition of the principles of monitoring, evaluation, and improvements from lean manufacturing. It also includes questions on other organizational practices such as decentralization. See Bloom et al. (2019).

[6] The authors supplemented this procedure with a GMM estimator in the first step to deal with biases stemming from the endogeneity of capital, labor, and materials.

The cross-section estimates revealed that of the high performance work practices, all of which were positively associated with productivity, only benchmarking was statistically significant. Unionization had no independent effect, although there was a positive and statistically significant association between unionization and nonmanagerial profit sharing. With one exception these associations carried over to the panel data estimates. The exception was the emergence of a negative own-effect of unionism on productivity, even if in this case the effect was more than counteracted by the positive interaction between non-managerial profit sharing and unionism.[7]

In a follow-up study, Black and Lynch (2004) revisit their earlier study to address the issue of a potential omitted variable problem if the regressors used in the second stage are correlated with unobserved time invariant plant level characteristics such as management quality (i.e. if more able managers are found in establishments that have greater recourse to, say, high performance work practices the latter coefficient will be biased upward). Black and Lynch now analyze a second wave of the EQW-NES that enables them to chart changes in work practices, etc., between 1993 and 1996. Production functions are estimated for 1996 and in first differences for 1993-96. The bottom line was that although some practices proved informative in cross section (chiefly, profit related pay), human resource management practices were usually insignificant after controlling for fixed effects. Indeed, reengineering was the only practice with a statistically significant pro-productive own effect, while that of worker meetings was strongly negative. For its part, the own effect of unionization was poorly determined throughout although when interacted with the worker meetings variable the effect was positive and statistically significant.

Bloom et al. (2011) characterize the relationship between human resource management practices and productivity in general as 'disappointing.' We choose to conclude by noting that there is some evidence of a positive interaction between unionism and individual work practices and that indeed some observers have gone so far as to claim that there is a hierarchy of productivity performance. On this view, unionized plants having innovative practices are located at the top – operating above those of non-union plants with the same set of practices – but are positioned at the bottom in the firmament of traditional workplaces. This message is also conveyed by Black and Lynch (2004) in that part of their analysis dealing with *synthetic workplaces*.

3.3 Works Council Impact

It was argued earlier that explicitly or implicitly the deliberative rights of works councils can lead to outcomes that benefit management and labor alike. Thus, sharing information can improve communication between the two sides and enhance trust. Similarly, consultation may help in solving organizational bottlenecks, as employees can have valuable input in finding practicable remedies. Further, codetermination rights guarantee workers more control over their working conditions and job security which prompts them

[7] We should also note that the positive effect of the proportion of workers working in groups – a measure of employee voice – was reported throughout for all but the GMM estimator.

to stay loyal to the firm in the longer run and invest extra effort to the benefit of the organization.

Most econometric studies of works councils focus on Germany.[8] A general assessment of the evolving German literature on works councils would be that the entity has a broadly favorable impact on firm performance (e.g. Mueller, 2011; Mueller and Stegmaier, 2017). However, the German evidence also suggests that such outcomes depend on framework conditions such as coverage by a sectoral collective agreement.

Moreover, case studies have revealed a range of industrial relations participation regimes characterized by cooperative or antagonistic relationships between the German works council and management (e.g. Wever, 1994; Frege, 2002). Economic studies have taken up this heterogeneity issue. One set of studies uses a one-time question about works council relations from the 2006 wave of the IAB Establishment Panel. to investigate the impact of works councils on firm performance, human resource management problems, and plant closure. The question asks the manager respondent how he or she would characterize the attitude struck by the works council in decision making as alternately (1) consensual, (2) pragmatic, or (3) hostile (The reference category is absence of a works council.) Work by Pfeifer (2011) indicates that pragmatic councils of type 2 have the highest productivity, while the estimated effect for type 3 councils is positive but statistically insignificant. Results for a subjective measure of profitability are negative for works councils of types 2 and 3, especially the former. The adverse profit result for type 3 works councils is consistent with their unimpressive productivity performance. On net, however, Pfeifer concludes that pragmatic councils are to be favored from a welfare perspective because they have the largest productivity effects and only moderately negative effects on profits, which latter result he sees as a component part of a necessary rent sharing function.[9]

Other German studies using the same question have produced somewhat different results. Thus it has been reported that establishments with 'dissonant' (i.e. type 3) or 'hostile or pragmatic' (types 2 and 3) councils are associated with higher rates of plant closure and experience greater personnel problems due to absence (see, respectively, Addison et al., 2020; Arnold et al., 2018)

The issue of works council type has also occupied studies of innovative work practices and firm performance in the German national machine industry, whose NIFA Panel (New Information Technologies and Flexible Work Systems) is the only survey (in its sixth wave) to contain a measure of the degree of engagement of works councils in processes of technological or organizational change. Five types of works council are identified by management, ranging from 'antagonistic' to 'excluded.' Incorporation of this survey question in labor economics studies has yielded mixed results. For example, in his examination of high performance work practices, Frick (2002) finds that firms with works councils tend to use more of such practices than their work council free counterparts but

[8] Exceptions include Fairris and Askenazy (2010) for France, Van den Berg et al. (2011) for the Netherlands, and Van den Berg et al. (2017) for Belgium.
[9] See also Pfeifer (2014).

that the number is actually highest where the entity is dubbed ‘antagonistic’ by management. Similarly, in Dilgers’ (2002) wider-ranging study, it is reported that works councils promote the use of flexible working time and reduce personnel fluctuations but the effects are not always well determined. On the other hand, Frick reports works council involvement in technological and organizational change that exceeds the legal or collective agreement norm has more high performance work practises, while Dilger also finds that in such circumstances their impact on product innovation is positive.

Other German studies follow the methodology suggested by Black and Lynch (2001), reviewed earlier, with especial emphasis being placed on selection issues and unobserved establishment heterogeneity. We consider just two studies here both of which use the Establishment Panel. In an examination of the productivity of high performance work practices, Wolf and Zwick (2001) identify seven practices that area subsequently consolidated in to two independent termed “organizational changes” (such as teamwork) and “incentives” (e.g. profit sharing) The authors authors fit an augmented Cobb–Douglas production function to cross-section data for 1999, including a selectivity-adjusted specification. They also fit a Cobb–Douglas function to data for 1996-1999 using panel estimation methods, and derive a fixed time invariant establishment-specific effect for each plant after Black and Lynch, which values are then regressed on the time invariant covariates – including organizational changes and incentives – again allowing for selection.

Both selection and accounting for structural differences matter. The positive effect on productivity of incentive mechanisms, observed in both cross-section and in the panel, seem to result from such schemes being introduced in times of plenty, when firms are doing well. That is, after correction for the endogeneity of such measures, the variable is no longer statistically insignificant. For their part, the effect of organizational changes is statistically insignificant in cross-section, with and without correction for selection. However, the coefficient estimate is both positive and well determined in the panel estimates, and after controlling for selection strengthens somewhat. The main message of this study, therefore, is that firms which introduce organizational changes seemingly have unobserved time invariant characteristics that decrease their productivity. Expressed differently, participatory work practices raise productivity. For its part, the separate works council effect while not robust in cross section has a significantly positive impact on the establishment fixed effect

Works council presence receives more emphasis in a subsequent study by one of the authors who revisits those practices found to be statistically significant in Wolf and Zwick – namely, organizational changes, now termed “participation.” Zwick (2003) considers works council impact on productivity over the same interval, albeit using a different panel estimator for the (first stage) production function, now controlling for the endogeneity of works council presence (as well as that of the participation variable). His second-step regression results for a specification in which works councils are assumed exogenous indicates that the innovative work practice variable is positive and well determined, elevating productivity by 25 percent. However, accounting for the non-random distribution of works councils in an endogenous switching regression model shows that the pro-productive effect of participatory work practices only obtains in works council

firms. Although the story is similar to that told by Wolf and Zwick – in the sense that innovatory practices are conceived to rectify structural productivity deficits – the main result is very different: innovations only bear fruit in works council regimes.

The main takeaway from this discussion is that the influence of the works council is not a given. Moreover, the dual system and with it the potentially moderating influence the sectoral collective agreement is a distinguishing characteristic of the German case. The deliberative role attributed to the German works council may be lacking in other regimes, or indeed works councils may be union dominated.

3.4 Affective Commitment

Speaking of the attitude of the works council reminds us of the crucial importance of the mutual understanding or trust between the two sides in both the collective voice and affective commitment models. We focus here on a single empirical study, namely a test the Akerlof-Kranton model by Brown et al. (2011).[10] The authors use matched data from the Management and Employee Questionnaires of the 2004 British WERS (Workplace and Employee Relations Survey). The Employee Questionnaire inquires of employees how strongly or they agree with the two statements: (a) *I share many of the values of my organization* and (b) *I feel loyal to my organization*. Answers to each question – the former demonstrating loyalty and the second commitment – are arranged to follow five-point indices from 0 ('strongly disagree') to 4 ('strongly agree') of rising loyalty and commitment. In practice a hybrid combination of the two questions is constructed to form a single five-point *commitment-loyalty index* (CLI). Data from the Management Questionnaire is then used to construct subjective measures of relative workplace financial performance and labor productivity, this time on a four-point scale from 0 ('below average') to 3 ('a lot better than average'). Brown et al. first explore the determinants of each ordered component/score of their CLI index and then consider whether this index in turn influences firm performance. The principal determinants of the CLI index are an extensive set of human resource practices all of which with two exceptions are constructed from responses to the Employee Questionnaire. They are grouped under organizational communication (comprising 4 five-point indices), employee involvement and participation (a set of 6 indices and 1 binary indicator), and organizational trust (4 five-point indices

The authors' generalized ordered probit model for employee CLI, suggests that establishments can exert control over the loyalty and commitment of their workforces, that is, foster attachments. Thus, the human resource practices are generally individually significant at the highest category of CLI and have the largest marginal effects level at this extreme of the CLI distribution. In turn, the results for performance indicate that employee commitment – now proxied by the average level of the employee commitment loyalty index – is positively associated with productivity improvement and financial gains. The results are stronger for establishments in which the principal occupational group is professional or associate professional, which groups the authors conjecture have a greater degree of autonomy and discretion over the tasks performed.

[10] Among other studies, see for example Gould-Williams (2003).

Research in this area thus offers support for the notion that employers can exert influence over the commitment and loyalty of employees to the benefit of the bottom line.

3.5 Human Resource Management Best Practices

As noted earlier, the new management practices literature is distinguished by its innovative survey methodology and focus on the employer side of the ledger. From the outset the new literature has paid careful attention to evaluating the quality of its survey data with both internal validation by resurveying firms and external validation by matching the data with information on firm accounts and stock market values. A key finding has been the large spread in management practices across firms and across countries, with a large tail of low scoring firms. Attention has focused on first explaining such variation in management practices and then on the consequences of poor management practices.

In an early study, Bloom and Van Reenen (2007) examine these issues using data from 732 medium-sized manufacturing firms in the United States, France, Germany and the United Kingdom. It is reported that poor management practices are a combination of weak product market competition, allowing their persistence, and family firms passing management control down by primogeniture (i.e. where the eldest son becomes the CEO without regard to his ability). Taken together, product market competition and family firms seemingly account for approximately one-half of the long tail of badly managed firms and for respectively one-half and one-third of the French and British management gaps vis-à-vis the United States. In turn, better management practices are strongly associated with superior firm performance; specifically, in labor productivity, the rate of return on capital employed, Tobin's *Q*, (reduced) firm deaths, and the average annual growth rate in sales. The productivity estimates follow a two-step procedure similar to that use by Black and Lynch (2001), described earlier, where the production function is estimated in a variety of ways. The results indicate that management scores explain between 10 percent and 23 percent of the interquartile range of productivity. The coefficient estimates of the management variable are positive and strongly significant for the four other measures of firm performance.

A veritable slew of management as a technology studies have further investigated the sources of differences in management practices across firms and countries and the relationship between management scores and firm performance. In addition to product market competition and family ownership, research has identified multinationals, exporters, human capital, information, and (light) labor market regulation as sources of improvement in management practices. A very recent study by Bloom et al. (2019), using U.S. data from two waves of the new closed-question MOPS dataset covering 35,000 firm in 2010 and 2015, focuses on two of these 'drivers' in the form of right-to-work (RTW) laws and learning spillovers from the entry of large plants (and in particular multinationals). Among the key reasons for the authors' choice of these two arguments are plausible causal identification strategies. In the case of RTW the identification strategies are difference-in-differences and a spatial regression discontinuity design. For learning spillovers the technique has a basis in the competition between counties to attract 'million dollar plants,' exploiting differences between winners and the immediate runners up. The passage of RTW laws is found to increase the adoption of structured management

practices, while learning spillovers proxied by the arrival of large new entrants in the winning county increases the management scores of incumbents. Of course, the former result might also be couched in terms of union strength or, more accurately, union weakness. Having found that RTW legislation increases structured management practices around pay, promotion, and dismissals but has little effect on other practices, Bloom et al. (2019: 1670) do in fact note that "unions frequently oppose such practices, which they believe give too much discretion to managers, so if unions are weakened by RTW then these incentives will likely become more prevalent." Nowhere else in the management as a technology literature, however, is there any reference to unions which is somewhat surprising considering the empirical literature on the 'effects' of management and organizational practices on performance on which it draws.

Accompanying the rapid growth of analyses of the causes of differences in management practices has been a parallel growth in estimates of management practices on performance, often within the same study. Thus, for example, Bloom et al. (2019) also examine the effect of management practices on productivity, survival and growth. They report a sizable productivity-management differential. Thus, increasing structured management from the tenth to the ninetieth percentile can account for some 22 percent of the parallel spread in productivity. This amount is approximately the same contribution as R&D, greater than that of human capital, and twice that of Information and Communication Technologies. Also, management practices are highly predictive of firm survival rates (and more so than total factor productivity): a one standard deviation increase in the management score is associated with a 3.1 percentage point fall in the probability of establishment death, or 26 percent of the mean death rate of 11.8 percent. Growth is also favorably impacted: a one standard deviation increase in management practices is linked with 7 percent faster growth.

Studies using updated WMS survey data point in the same direction, while confirming the role of greater competition as a stimulant to better management practices. Thus Bloom et al. (2017) using data on 11,000 firms in 34 countries and a panel of up to four years find that firms that scored more highly in the management quality index improved their productivity performance both in cross section and in specifications that included a full set of firm fixed effects. In addition, the coefficient estimates for the management *z*-score were positive and statistically significant for employment growth, the rate of return on capital, Tobin's *Q*, and survival (as measured by the probability of not exiting by 2011 conditional on being alive at some point over 2004-2010). Further, on average 30 percent of a country's deficit in total factor productivity vis-à-vis the United States was found to be management related.

Finally, in another recent development, a study by Bender et al. (2018) uses the WMS data for a specific country, Germany, which it then links with German employees' longitudinal earnings data from the Integrated Employment Biographies (IEB), maintained by the Institute for Employment Research (IAB). Building on the model of Abowd, Kramarz, and Margolis (1999) to decompose earnings into their worker- and firm-specific components, the authors run production functions containing, in addition to management *z*-scores, measures of mean employee ability (the mean level of the individual worker fixed effect), mean management ability (taken from the top quartile of

the worker ability distribution) and the firm-specific wage premium. With the introduction of the worker- and firm-fixed effects the positive effect of management scores is reduced but it remains statistically significant. In their preferred total factor productivity specification, the authors estimate the component contributions of the worker and firm fixed effects to the (30 percent) reduction in the management score produced by their inclusion. It is the unobserved component of human capital for *managers* at the firm that matters most. In a separate analysis of job inflows and outflows, it is reported that better managed firms recruit higher ability workers and fire lower ability workers to a greater extent than do low scoring firms.

The foregoing suggests that the interpretation of management as a technology has made very considerable progress in advancing our understanding of one key correlate of establishment performance. However, our review of the wider literature suggests that the issue of worker engagement merits serious consideration alongside this new interpretation of human resource management, not least for a sample of countries defined by their membership of the European Union.

4 Modeling

In a standard two-input setting, firm output is a function of how labor and capital inputs are optimally combined. Assuming for convenience that output is solely a function of two management inputs, say Human Resource (HR) practices and non-HR practices, it then follows that the selection of the optimal quantities of individual practices of either kind will be determined by the tradeoff between relative costs and relative benefits.[11] An implication that follows from this conventional economic approach/equilibrium solution is then the possibility that profit maximizing firms optimally sort themselves in a heterogeneous fashion. As a result, the relationship between, say, *good* management practices and firm performance might not be easily discernible in the data.

Nevertheless, *good* management practices seem to be on the rise. Although one wonders whether the principle of *what exists is best* is a good guide (Lucas, 1978: 510) if good practices are increasingly popular then one perhaps cannot exclude the possibility that some practices are more closely related to higher performance than others. In this case, some disequilibrium is likely to be observed in the marketplace, with some firms being unable to keep up with the market standard in terms of efficiency. As discussed in section 2, the managerial technology approach sees a large role for inefficiencies. It then follows

[11] Assuming a CES production function, $Y = \left[a_1 M_1^{\rho} + a_2 M_2^{\rho}\right]^{1/\rho}$, minimization of $w_1 M_1 + w_2 M_2$ subject to $Y^{\rho} = a_1 M_1^{\rho} + a_2 M_2^{\rho}$ yields the relative demand function $log \frac{M_1}{M_2} = \frac{1}{\rho - 1} log \frac{w_1}{w_2}$, where $a_1$and a_2 were set to 1 to simplify the derivation. $M_1$and M_2 denote HR and non-HR practices, while w_1 and w_2 are the corresponding unit input prices. Assuming a different parametrization for a_1 and a_2 it can also be shown that a higher incidence of M_1 (say employee involvement) may be anticipated in situations where the proportion of highly educated workforce is greater as the benefits of the former are increasing in the latter. This proposition is examined below.

that some practices are expected to be associated with failure/exit or reduced growth. In particular, good practices will certainly be more often found when competition is severe.[12]

Management practices are therefore assumed to have some positive effect upon, or be favorably associated with, firm performance. To simplify the discussion, consider a generalized Cobb-Douglas, two-input production function, as follows:

$$Y = AL^{\alpha}e^{\beta M}, \qquad (1)$$

where M is a single-dimension variable denoting *the extent to which firms adopt more structured practices* (Bloom et al. 2019: 1656) and L denotes labor. From (1) we can easily derive an empirically testable relationship in which labor productivity is a function of the overall index of management practices:

$$log\frac{Y}{L} = \log A + (\alpha - 1)logL + \beta M. \qquad (2)$$

Interpretation of β in this framework is straightforward: a one-unit change in M yields the percentage change in labor productivity [$\left(e^{\beta} - 1\right).100)$].

Next, we consider some possible drivers of M; in particular, the hypothesis that M depends on some labor institution, R, such as the type of worker representation at the workplace. In this context, it is conceivable that management practices are more costly (or the converse) under certain types of workplace representation. Denoting the unit price of the single-index practice by w_M, we then have w_M as a function of R; for example, expressed in log form $\log w_M = \theta R$. Then, using model (1) with $M = \log \widetilde{M}$, the implied (conditional) demand function for management practices M is ultimately a function of R, as follows:

$$M = a + \gamma R + \frac{\alpha}{\alpha+\beta}\log w_L + \frac{1}{\alpha+\beta}\log Y\ . \qquad (3)$$

Whether R is positively ($\gamma > 0$) or negatively ($\gamma < 0$) associated with M is a matter of empirical investigation.

Good management ultimately fuels worker identity with the firm or worker commitment Akerlof and Kranton (2000; 2005). As we have seen, identity seems to be especially relevant in a context in which effort is difficult to be observed and difficult to be rewarded. And even if worker motivation responds well to monetary incentives, it may nevertheless be profitable for firms also to initiate non-pecuniary incentives, seeking to inculcate identity (viz. sharing in the organization's mission). Since intrinsic motivation can elicit

[12] Another implication might be that if good management practices increase overall efficiency in the economy (and wages, in particular), and talented managers seek to maximize output, then marginal managers will increasingly become employees. In this case, large firms will become even larger due to the managerial inefficiency of their smaller counterparts. Consequently, good management practices and performance will not only be positively associated but also causally related (Lucas, 1978).

higher effort from workers at a lower cost, an appropriate set of management practices is expected to be related with improved performance.

In this setting, a worker taste for *identity* implies that any deviation from the norm (i.e. some prescribed ideal) is utility decreasing. As a result, a worker who fully identifies with the organization (an *insider*) sacrifices utility by deviating from a high effort regime, no less than an outsider who deviates from a low-effort strategy. In a principal-agent framework it can be then shown that it is profitable for a firm to incur some cost q to inculcate identity among those who in principle value being a part of the firm so that they choose a high effort strategy – rather than pursue a low effort option – at a reduced wage cost. All is required therefore is a utility function that depends upon both pecuniary (w) and non-pecuniary arguments; that is, $u(w, e, c) = \log w - e + I_c - t_c|e^*(c) - e|$, where e denotes actual worker effort and I_c is the identity taste for agent type c (either insider or outsider). For $t_c > 0$, the last term indicates the penalty from deviating from the norm, which is equal to $t_O|e_B - e_A|$ in the case of an outsider (O) and $t_N(e_A - e_B)$ for an insider (N). The prescribed effort level, $e^*(c)$, is assumed to be equal to e_B and e_A for an outsider and insider, respectively (i.e. $e^*(O) = e_B$ and $e^*(N) = e_A$, with $e_B < e_A$.)

Assuming that the participation and incentive constraints bind for workers of each type, and that the optimal wage for an insider (outsider) is given by w^N (w^O), it follows that $(\log w_H^O - \log w_L^O) > (\log w_H^N - \log w_L^N)$. It turns out that this condition requires that $t_O + t_N > 0$, a true statement as t_c is positive for any worker type. In other words, inducing elevated effort (H) is less costly in the case of an insider than for an outsider. It is then up to the firm to instill the required degree of worker identity through the selection of *good* management practices. (The proof is contained in Appendix 1.)

In our empirical work, firm performance is observed as a categorical and ordered variable, both in the case of the financial situation of the establishment and its labor productivity, the two performance outcomes observed in our dataset. The former measure denotes the financial situation on a 1 to 5 scale, with 1 being the lowest level. The latter measure indicates the establishment's current labor productivity in comparison to the situation three years earlier. It is reported on a 1 to 3 scale, again from low to high. Given the ordered response to the firm performance question, and the fact that the information is nested within clusters (i.e. countries), our first empirical implementation is a multilevel mixed effects ordered logistic model, as follows:

$$Pr\,(y_{ij} > k\,|X_{ij}, M_{ij}, \boldsymbol{\kappa}, \boldsymbol{u}_j) = H(X_{ij}\beta + \delta M_{ij} + \boldsymbol{u}_j - \kappa_k), \qquad (4)$$

where $H(.)$ is the logistic cumulative distribution function, y_{ij} is the selected (ordered) performance measure, M_{ij} denotes the overall management practice, and i and j are indices indicating establishment and country, respectively. κ_k denotes the cut-point for the corresponding firm performance category k. (Recall that k =1, 2, 3, 4, 5 for the financial situation response, and for the labor productivity case we have k =1, 2, 3.) $\boldsymbol{u}_j$ gives the set of country random intercepts, while X_{ij} is the vector of establishment characteristics. These observed characteristics are described in section 5 and Appendix Table 3.

We proxy worker identification with the organization, or worker commitment, by using the survey information on the extent to which the establishment confronts a poorly motivated workforce. The raw information was recoded so that we have a newly ordered variable equal to 1 if motivation of employees is high, 0 otherwise. In order to test whether management practices are associated with a higher degree of worker commitment, we therefore specify a multilevel mixed effects logistic model, as follows:

$$\Pr\left(Worker\ identification_{ij} = 1 \middle| X_{ij}, M_{ij},\ \boldsymbol{u}_j\ \right) = H(X_{ij}\beta + \delta M_{ij} + \boldsymbol{u}_j). \quad (5)$$

where $Worker\ identification_{ij}$ is our selected proxy for worker commitment. M_{ij}, $\boldsymbol{u}_j$, and X_{ij} are as reported in model (1).

Since formal worker representation at the workplace, R, may well have a direct effect on firm performance, and not merely an indirect effect operating via M, we also extended model (4) to include a four-element formal representation variable, as well as the corresponding interaction terms with the management practice variable M, as follows:

$$\Pr\left(y_{ij} > k \middle| X_{ij}, M_{ij}, R_{ij}, \boldsymbol{\kappa}, \boldsymbol{u}_j\right) = H(X_{ij}\beta + \delta M_{ij} + \sum_l \lambda_l R_{lij} + \sum_l \eta_l R_{lij} * M_{ij} + \\ + \boldsymbol{u}_j - \kappa_k), \quad (6)$$

where subscript l in R_{lij} denotes the type of worker representation, comprising union only, works council only, the presence of both systems (for $l = 1, 2, 3$, respectively), and where absence of formal worker representation (i.e. 'none') is the omitted category.

Finally, the hypothesis that worker commitment is associated with performance, controlling for worker representation, is tested by again using a multilevel mixed effects ordered logistic model:

$$\Pr\left(y_{ij} > k \middle| X_{ij}, Worker\ identification_{ij}, R_{ij}, \boldsymbol{\kappa}, \boldsymbol{u}_j\right) = H(X_{ij}\beta + \\ \gamma Worker\ identification_{ij} + \sum_l \lambda_l R_{lij} + \sum_l \eta_l R_{lij} * Worker\ identification_{ij} + \\ + \boldsymbol{u}_j - \kappa_k), \quad (7)$$

where R_{lij} denotes the type of workplace representation as defined in the context of model (6).

In order to simplify the interpretation of the results, we will also report marginal effects, obtained by fixing the random effects at their theoretical mean (i.e. zero) and all control variables at their sample mean.

5 Measuring Management Practices, Worker Representation, and Performance

Our study uses the cross-country information on management practices available in the 3rd European Company Survey (ECS) of 2013. These data are extracted from the Management Questionnaire, a representative survey covering some 27,000 establishments with at least 10 employees, across 32 European countries. We focus on the 28 member countries of the European Union, including the United Kingdom. The raw

information was obtained from the U.K. Data Service site at *https://www.ukdataservice.ac.uk*/. In each selected country, the number of units being interviewed is around 500, 1,000, and 1,500 in small, medium, and large countries, respectively, altogether comprising a total 24,471 units in the selected 28 countries. Both private and public sector establishments from virtually all sectors of activity, excluding agriculture, are included in the survey. The interviews were conducted with the most senior official responsible for human resources management, who also identified the official structures for employee representation at the establishment.

Management practices are extensively covered in the ECS survey. Specifically, the selected items are extracted from the following survey sections: E-Work organization practices, F-Team work and Task Rotation, H-Human Resource Management practices, and J-Employee involvement. Based on these four sections we selected 21 items which were then grouped in 7 domains. These domains are summarized in Table 1 and they comprise: 1-Work organization practices and monitoring (3 items); 2-Team working (1 item); 3-Performance appraisal (1 item); 4-Incentive/performance-based pay (5 items); 5-Employee involvement (7 items); 6-Skill development/training (3 items); and 7-Provision of information to employees and participation in decision making (1 item). The latter domain is restricted to establishments in which at least one major change had occurred in the preceding three years. All items were then recoded into a 0-1 or 0-2 ordering (0-6 in the case of domains 3 and 6) using the procedures described in Appendix Table 1. In all such cases, 0 indicates that the practice is absent. Since the ECS survey does not provide information on the qualitative nature of the on- and off-the-job training, our descriptive and regression analysis below will focus on domains 1 to 5. As a separate exercise, we also look at domains 1 to 5 plus 7. In this case, there is a sizeable reduction in sample size of approximately one-third.

To assure a common scale, we follow Bloom and Van Reenen (2007) and standardize all the selected items. By way of illustration, for domain 1, which it will be recalled contains 3 items, each item is standardized using the mean and standard deviation across all establishments. A single indicator (for domain 1) is then constructed by taking, for each establishment, an unweighted average of the selected three *z*-scores; and similarly for all other domains. To obtain an overall, single-indicator of management practices for each establishment we took the unweighted average across all single-domain indicators. In practice, this procedure generates both single-domain and overall indicators of mean zero. A simple 'row total' variable is also generated. In this last case, we simply add up all raw scores observed at establishment level to obtain an overall index that is contained within in the closed interval of 0-25 (0-27) in the case of domains 1 to 5 (1 to 5 and 7).[13]

[13] Our descriptive and analytical analysis below is therefore focused on two overall indexes, alternatively based on the unweighted average of *z*-scores of individual practices *and* the sum of the corresponding raw scores. Section 9 describes the analysis based on other approaches. Given the evidence found in other studies, which suggest strong robustness to the introduction of alternative approaches based on factor analysis (e.g. Bloom and Van Reenen, 2007: 1367; Bloom et al., 2019: 1656), this method is not included in our experiments. We also note that our domains, described in Table 1, include only a few, very homogeneous items. Experimentation with an index comprising the average of raw scores yielded similar results.

We also code the type of worker representation present at workplace. This information is again obtained from the Management Questionnaire from which it is also possible to distinguish formal from informal representation. For example, formal workplace representation in the United Kingdom requires the presence of some recognized shop floor trade union representation *or* of a joint consultative committee. In contrast, any *ad hoc* form of worker representation is classified as informal, including occupational safety and health committees. As noted earlier, based on the raw information on the type of workplace representation, we generated a 4-way variable distinguishing between the following mutually exclusive establishment categories: (a) without the presence of any formal employee representation body; (b) with trade union representation only; (c) with work councils type representation only; and (d) with both types of representation. Our grid for assigning formal employee representation at establishment level is described in Appendix Table 2.

Regarding firm performance, survey respondents were asked to rate both the current financial situation and the labor productivity of the establishment. Specifically, the current financial situation is coded as an ordered variable on a 1 to 5 ascending scale, where category 1 denotes 'very bad' and category 5 'very good.' For its part, current labor productivity is compared with the situation some three years earlier on a 1 to 3 scale, again in ascending order from low to high, where category 1 denotes that labor productivity had decreased, category 2 that it was unchanged, and category 3 that it had increased.

Finally, our establishment-level characteristics include sector (industry) affiliation, establishment size (number of employees), single versus multi-establishment organization, as well as workforce composition by skill and occupation. Collective agreement status is also recognized. These and all other variables are described in Appendix Table 3.

6 Management Practices across Countries and Firms

Management practices are as expected heterogeneous across countries. Using our overall index of management practices that comprise domains 1 to 5, Figure 1 plots the derived country rankings for the 28-nation sample from worst (negative) to best (positive) practice. By construction, it will be recalled, the overall index increases with the use of individual items described in Table 1. In the limit, a country in which all items are absent will score the lowest overall index while high scores indicate that the selected practices are extensively used in a country.

As can be seen, the four biggest European economies are ranked 2nd (Italy), 12th (France), 17th (United Kingdom), and 18th (Germany). This relative country ordering can also be found in Bloom and Van Reenen (2011b: Figure 2.3), while in Bloom and Van Reenen (2007: Table A1) the United Kingdom and France reverse their relative positions.[14] We

[14] Based on the results reported on Figure 1, we ran a standard *t*-test on the equality of means for Germany, UK, France, and Italy. As suggested by the figure, the mean of management practices in the

note that the latter study is based on an extensive survey of management practices in 732 medium-sized manufacturing firms in the United States, France, Germany and the United Kingdom; whereas the former study while using the same set of questions has a different sampling frame, comprising a worldwide set of countries. It also contains 5 additional European countries, which are ranked as follows: Greece, Portugal, Ireland, Poland, and Sweden. This latter ordering is replicated in our Figure 1, except that Poland now precedes Ireland. In short, there is no indication that the country ordering found in the ECS data is sui generis.

(Figure 1 near here)

Differences in management practices *within* countries are even more pronounced. Indeed, only 11 percent of the overall variance in firm-level management practices is across countries, while the remaining 89 percent is within country.[15] Firms therefore differ in their practices to a very substantial degree. For example, it is clear from the distribution of raw scores across all selected management practices in Figure 2 that there is a substantial fraction of firms for whom the practices are mostly absent, a pattern that seems to be common to all countries in the sample, with very few exceptions. As in the two studies by Bloom and Van Reenen referred to above (see also section 2), we can confirm that in our data too there is a long tail of *badly* managed firms, that is, organizations with a low frequency (or a low score) of the selected management practices. Similar findings are also found after having controlled for establishment size. *Vulgo*: bad management practices are not specific to any particular firm size configuration, even if the lower tail is longer for smaller establishments.

(Figure 2 near here)

7 Management Practices across Worker Representation Types

In our sample, establishments without formal representation make up approximately 52 percent of the total. They clearly dominate the 12 percent of establishments having trade union representation only, the 21 percent with works council representation only, and the 16 percent having both institutions present.

Table 2 also contains some cross tabulations to illustrate the relationship between these worker representation types and management practices, focusing exclusively on our largest sample (namely, the domains 1 through 5 case). Mean values of the overall index of management practices, based on *z*-scores of the individual practices populating domains 1-5, are reported in column (1) of the table for establishments with and without worker representation. Evidently in European establishments the selected management practices are more often found in situations where there is formal worker representation

case of German and U.K. establishments was not statistically different, while the mean in German establishments is significantly larger than in their French and Italian counterparts (at the 0.01 level).

[15] The variance components were estimated using the command mixed in Stata (Marchenko, 2006). The decomposition is invariant with respect to the chosen management practice measure (*z*-score or raw score).

at the workplace. The mean value for the group of establishments without any formal worker representation (at -0.123) in the top cell in the first column of the table is significantly smaller (at the 0.01 level) than the corresponding mean in any of the other three groups. Note that we obtain a similar result for the alternative raw score measure in column (4): the mean is again highest when both types of formal presentation agency – unions and works councils – are jointly present. Observe also that although absence of workplace representation is more likely in small establishments with 10 to 49 employees, the results in Table 2 hold throughout; that is, for all establishment size groups, the mean for the no worker representation group is always significantly smaller than for the other three workplace representation categories. (Full details are available for the authors upon request.)

(Table 2 near here)

In columns (2) and (3) of the table, the relationship between worker representation and management practices is illustrated using *z*-scores for two individual domains, namely incentive/performance-based pay (domain 4) and employee involvement practices (domain 5). With respect to column (2) in particular, there is no suggestion that incentive/performance based-pay schemes in European establishments are more likely to be encountered in workplaces without worker representation. The situation is therefore distinct from the North American case (e.g. Bloom et al., 2019). In other words, in the European case there is evidence of some complementarity between worker representation and the practice of incentive pay. For their part, the results for employee involvement practices in column (3) maintain the ordering established for incentive pay in column (2).

A final aspect of Table 2 worthy of note is the finding that the standard deviation of the selected management scores is virtually the same across all worker representation groups. The implication is therefore that dispersion of management practices is approximately constant across worker representation types. This is confirmed by looking at the distribution by quantiles. For example, in the case of the data in column (4), the 25, 50 and 75 quantiles are always smaller in the no worker representation group than for the other groups, while in each quantile, the ranking across groups is maintained. From this point of view, there is no obvious difference between union and works council type representation, a finding that may occasion some surprise. These findings are illustrated in Figure 4, where it can be seen that the distribution of management scores is similar across establishments with worker representation (*Union*, *Works council*, or *Both*) *and* seemingly distinct from the no worker representation case (in the top left panel of the figure).

(Figure 3 near here)

8 Management Practices and Performance: Regression Results

Table 3 presents the relationship between establishment performance and management practices using model (4). To simplify the discussion, the implementation uses only two alternative overall indexes of management practices, comprising domains 1 to 5 and 1 to 5 and 7, in separate cases. The financial situation and labor productivity growth indicators

are the two alternative establishment outcomes. The results for the two alternative management indexes are given in main rows 1 and 2 of the table, while the results for the separate outcomes are reported in columns A and B. The analysis of other indicators of management practice is remitted to section 9. In the interests of economy, we will focus here exclusively on the performance-management practices relationship, although the role of the other covariates will be addressed later.

The management practices index based on domains 1 to 5 in main row 1 is positively and significantly associated with financial performance (column A). The point estimate of 0.529 is statistically significant at the 0.01 level. Evaluated at the mean of all included variables, we have the result that an increase of 1 unit in this particular overall indicator of management practices is associated with an increase in financial performance of 0.011. It will be recalled that the outcome indicator is an ordered categorical variable, on a five-point scale. Accordingly, we can compute the corresponding effect on the predicted probability of each financial outcome category, from the lowest (category 1) to the highest (category 5). Specifically, a 1-unit increase in the overall indicator (slightly more than a 1-unit change in the corresponding standard deviation) is associated with a -0.006 decrease in the probability of outcome category 1. A similar computation yields a 0.07 increase in the probability of establishment performance being in the highest category.

(Table 3 near here)

These results hold for the alternative management practices index in main row 2 of the table. This composite measure adds information on the degree of worker participation in decision making. Including this information implies a considerable reduction in sample size from 20,803 to 13,412 observations. However, as it is apparent, both the overall coefficient and the corresponding marginal effects are virtually unchanged.

Column B of the table shows the relationship between labor productivity growth and management practices. The estimates are highly statistically significant in main rows 1 and 2. Thus, for example, a 1-unit change in the overall index is associated with an increase in the probability of positive labor productivity growth (i.e. outcome category 3) of 0.156 and 0.148, respectively. The magnitude of these effects is far from trivial, suggesting that management practices do matter. We note parenthetically that the underlying diagnostic statistics reported in the notes to the table are as expected; that is, the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic case.

It has been hypothesized that good management practices may instill worker commitment to and identification with the organization. From this perspective, the best practices described by adherents of management as a technology may also be construed as engendering heightened worker attachment to the organization. In Table 4 we examine the determinants of worker commitment using management's perceptions of worker motivation as the selected binary dependent variable. As in the preceding table we focus on two overall measures of management practices that summarize, in a single structured index, the information contained in domains 1 to 5 and domains 1 to 5 plus 7, respectively, and use the same set of controls. Results of fitting a multilevel mixed effect logistic model

as described in equation (5) are given in Table 4. Again, the null of an ordinary logistic model is comfortably rejected.

(Table 4 near here)

As expected, the management practices indexes are highly statistically associated with worker motivation. Specifically, in column (1) it is estimated that a 1-unit change in the management practice composite is associated with a 0.071 increase in the probability of a high worker motivation. For the subset of establishments with a major organizational change in the last three years, for which we also have additional information on the extent to which employees have been involved in joint decision making, shown in column (2), the corresponding marginal effect is highly statistically significant and larger at 0.121. In sum, we confirm that low worker commitment is unlikely to be found in establishments with a high frequency of the selected management practices.

Regarding the behavior of the covariates, note that worker motivation is greater (lower) in establishments with a higher proportion of university-trained (part timers). In both cases, the associations are statistically significant at the 0.01 level. A weaker attachment/lower affective commitment relationship is indeed expected from non-full time workers, while workers with the highest schooling level, occupying higher levels of the organization's hierarchy and more likely involved in joint decision making, are expected to share the organizations' values and mission to a greater extent. The public services sector is also positively associated with our proxy for worker commitment, while larger establishment size (i.e. with at least 50 employees) seems to decrease the probability of high worker motivation by 6 to 7 percentage points relative to smaller establishments (i.e. with less than 50 employees). These correlations are clearly larger than those reported for type of collective agreement and type of organization (single/multiple unit) variables, which are in general statistically insignificant and in no case statistically significant at better than the 0.10 level.

Tables 5(a) and 5(b) examine the performance-management practice relationship controlling for the presence of formal workplace representation, after equation (6). Observe that in addition to the 4-way worker representation variable the corresponding interaction terms with the relevant index of management practices are also included in the specification. We again look at two types of performance outcomes, namely the financial situation and labor productivity growth, and as before (in Tables 3 and 4) for two distinct overall indexes of management practices.

(Table 5(a) near here)

Beginning with Table 5(a), it can be seen from the first row of the table that the role of the management practices indicator is largely unchanged vis-à-vis Table 3 which serves as the comparator. The coefficients and the corresponding marginal effects are each highly statistically significant and their relative magnitudes are maintained.

Next, reported establishment financial and productivity performance is superior in establishments *without* worker representation. The latter scenario serves as the default

and as is evident the coefficients for all three included groups are negative.[16] We have therefore the result that although the selected management practices are relatively more frequent in establishments with formal worker representation (see Table 2), it seems that the direct effect of its presence is not necessarily positive compared with a situation in which formal representation is distinguished by its absence. Unsurprising perhaps is the ordering across worker representation institutions in column A, where the *Works council-only* variable is associated with a smaller negative effect on financial performance than the *Union-only* and *Both* variables. That being said, the null that the coefficients on the three worker representation variables are all equal is not rejected at the conventional levels for column B.

Finally, however, as in all cases the null of no joint statistical significance of the three interaction terms is not rejected at the 0.01 level, there is no strong indication that the role of management practices varies much across workplace representation types. In other words, the selected management practices are likely to be favorable to performance, both with or without formal workplace representation.

Turning to Table 5(b), the measure of management practices is now extended to comprise the information on employee participation in decision making (i.e. domain 7), which it will be recalled implies a sizeable reduction in sample size as the included establishments are confined to those experiencing a major organizational change in the preceding three years. From column A observe that *Works council-only* establishments are no longer associated with worse financial performance than establishments without any workplace representation, while for column B the corresponding coefficient remains negative and significant (now at the 0.05 level). In both columns of the table the coefficient on the *Both* variable is negative and records the largest absolute magnitude. Regarding the interaction terms at the foot of the table, we confirm the results obtained in Table 5a, namely that the joint test on the null that the coefficients of the three terms are all equal to zero is not rejected in column B, whereas in column A it is rejected only at the 0.05 level.

(Table 5(b) near here)

These conjectures on the role of workplace representation are next put into perspective using model (7), which probes the relationship between establishment performance and worker commitment with controls for workplace representation. The results are given in Table 6. Beginning with the results for the financial situation, the positive coefficient estimate for worker commitment (as proxied by perceived worker motivation) shown in the top left cell of column A of the table is both highly statistically significant and large in magnitude. Also note that a higher worker motivation is associated with an increase of 0.094 in the predicted probability of the highest score (category 5) of the financial situation indicator.

[16] This result was undisturbed when we ran the model across separate samples comprising small, medium, and large establishments.

(Table 6 near here)

Observe that controlling for worker motivation we now have the result that while union representation (either alone or in conjunction with a works council) is associated with reduced performance (versus no representation at all), the works council coefficient is not statistically significant from zero. Controlling for worker motivation, therefore, we have the result that there is no statistical difference in financial performance between establishments without representation and their counterparts reporting works council-only representation. Moreover, the three interaction terms at the bottom of the table are not jointly statistically different from zero at the 0.01 level.

The results in column B of the table confirm not only that worker commitment is strongly associated with improved labor productivity but also that its role does not vary by worker representation. Further, there is now seemingly no suggestion that labor productivity is directly impacted by any particular type of worker representation, or its absence. Indeed, none of the corresponding coefficients in column B is statistically significant.

(Figure 4 near here)

The latter result can be further illustrated by plotting the predicted probability that labor productivity increased (outcome-category 3) across worker representation status using the full model. As can be seen from Figure 5, the pattern is rather flat: the probability of observing category 3 is 50 percent among establishments with no worker representation and virtually the same value (49 percent) among each of the three counterparts with some type of formal workplace representation. Given that labor productivity may offer a better efficiency benchmark than financial performance, this finding entails a non-trivial implication, as it may suggest that the type of worker representation is after all of second order of importance, while worker commitment and good management practices are of first order.

9 Sensitivity of the Results to Alternative Measures of Management Practices

The regression results in Tables 3 through 6 were based on a constructed overall index of management practices. We also permitted some variation in index composition by allowing for a supplemental domain. But in all cases the management practice composite was obtained after standardization of the scores observed on individual items. In Table 7, rather than using *z*-scores, we use raw scores in the manner described in the data section. By construction, a given establishment in this case scores a minimum of zero, if all selected practices are absent. In the interests of economy, our re-runs are centered on Table 3.

(Table 7 near here)

From the first row of the table it can be seen that the raw score structured sum of management practices is strongly associated with favorable performance. This is true of both the financial situation of the establishment and its labor productivity growth where

the coefficient estimates of the management practice measure are 0.055 and 0.065, respectively. To gain an understanding of the corresponding marginal effects, which are not reported in the table, we would first note that the effect of a 10-unit change – from a total of raw score of 10 to 20 – on the (mean) probability of category 5 (column A) and category 3 (column B) were increases of 0.06 and 0.16 percentage points, respectively. Again, these are rather large effects that are fully comparable with the findings reported in Table 3. Second, by way of further illustration, Figure 6 gives the probability of achieving the highest financial performance outcome (i.e. category 5) for all raw score levels, evaluated again at the mean of all included variables. As can be seen, additional deployment of best practices is not only reflected in an improvement in establishment performance but also at a slightly increasing rate. Turning to the sum of raw scores in domains 1 to 5 *and* 7, given in the second main row of the table, virtually the same results are obtained.

(Figure 5 near here)

Next, in Table 8, we abandon the use of a single (overall) index. Panel A of the table deploys domains 1 to 5 as separate regressors. Panel B adds domain 7 as a separate regressor. Panel C presents results from running the model in separate regressions for each domain. We focus on the relevant coefficient estimates and their statistical significance, and on this occasion ignore the corresponding marginal effects.

Beginning with panel A, observe that all the coefficient estimates other than that for the profit outcome (domain 2) are positive and statistically significant at the 0.01 level. As expected, the magnitude of the coefficients is smaller than in Table 3 as a single indicator has now been replaced by five distinct indexes. The results in Panel B sign, magnitude, and statistical significance these coefficient estimates are maintained. That is, the results in panel A are not sensitive to restricting the sample to establishments with a major organizational change in the preceding three years with the introduction of an additional practice. For its part, the new domain is only statistically significant in the case of labor productivity growth.

Finally, in panel C of the table, observe that in estimating separate outcome equations for each domain the results are either maintained or strengthened. Domains 2 (team working) and 7 (provision of information to employees and joint decision making) are now statistically significant at the 0.01 level. To make sure that the results provided in Table 3 were not sensitive to the exclusion of domain 2, we also re-ran the regressions summarized in the first two rows of the table excluding that domain. The results were largely unchanged.

Taken as a whole, the results in Table 8, strongly suggest that domains are statistically significant and positively associated with the two establishment performance measures, especially labor productivity. Even if the magnitudes are admittedly smaller for some domains than others, the main point seems to be that there is no strong indication that the use of a single, overall index is misleading as far as the estimated relationships in Table

3 are concerned. Similar findings were obtained in replicating Tables 4, 5 and 6. (Although not provided here, these results are available from the authors upon request).[17]

(Table 8 near here)

10 Conclusions

This paper has offered an original investigation of the new management practices model – management as a technology – for a full sample of European countries in a framework that explicitly recognizes worker representation institutions and incorporates the notion of affective commitment from the human resource management and psychology literatures, as applied by Akerlof and Kranton.

The results of this inquiry may be itemized as follows. First, and consonant with the new management practices model, is the finding of considerable cross-country diversity in the use of management practices; which heterogeneity is even more pronounced across firms within countries where there is long tail of poorly managed firms. Second, management practices are strongly associated with firm performance, with high scoring firms (indexing better management practices) tending to fare better than their low scoring counterparts. Third, the selected management practices are more often encountered in situations where there is formal worker representation at the workplace, a result that is robust across different establishment size groups and which runs counter to the suggestion that formal worker representation and high performance work practices are substitutes. Fourth, a one-unit increase in the overall indicator of management practices yields a 0.07 (0.15) percentage point increase in the probability of establishment financial performance (labor productivity) being in the highest outcome category. These results are replicated for alternative overall management indexes. Fifth, low worker commitment is unlikely to be found in establishments with better management practices. That is, the association between the overall index of management practices and worker motivation is positive and highly statistically significant. Sixth, controlling for management practices and worker representation, the hypothesis that the financial situation and labor productivity is superior in establishments without worker representation is *not* rejected by the data. In particular, there is no strong indication that the role of management practices varies much across workplace representation types, the suggestion being that the selected management practices are likely to be favorable to performance, both with and without formal workplace representation. Seventh, greater worker commitment is strongly associated with improved financial situation *and* labor productivity, and its role does not seem to vary by worker representation type. Irrespective of the selected performance indicator, the evidence also indicates that no significant difference seems to exist between works council-only representation and no presentation at all. In the case of labor productivity in particular, the included worker representation institutions are all insignificant. If one

[17] As a quick check on complementarity across practices, we tested for the combination of any two domains by adding in each case an interaction term. Taking domains 1 and 2 as cases in point, this amounts to including two separate terms, one for each domain and the corresponding interaction. In only one case out of ten was the interaction term statistically different from zero.

considers labor productivity performance as a preferable efficiency benchmark, the implication then is that the type of worker representation is ultimately of second order importance while worker commitment and good management practices are of the first order. Finally, experimentation revealed that the above results were not sensitive to the use of raw scores rather than *z*-scores in constructing the overall index of management practices or, for that matter, to the use of separate domains in a single regression or separate regressions by domain.

Our single cross-section empirical models cannot of course establish any single causal relationship: they are all conditional correlations by nature. Our approach shows, however, that the estimated relationships might be indicative of a genuine causality. It is certainly no coincidence that our overall indicator of management practices generates a country ordering that looks sensible and similar to other studies in which causal effects have ultimately been claimed. One fruitful line of future research will be to formally identify the component contributions of worker commitment and management practices to the performance outcomes. The extant literature has reported that, although the overall management score is also linked to positive outcomes for workers in the form of better work life balance indicators, the latter have no effect on productivity conditional on management practices (Bloom et al., 2009). This is of course not to suggest that these pro-worker features can be equated with worker commitment – or for that matter to ignore the issue of potentially negative outcomes for workers implicit in the fixing/firing of underperformers also revealed in the new literature. Rather, it again points to the need to incorporate the important contribution of Akerlof and Kranton on identity and the economics of organizations into the challenging new model of management as a technology. The present treatment is to be regarded as only a very preliminary attempt to point to the imbalance.

Appendix 1: Worker Identity and the Selection of Good Management Practices

In the following, we illustrate the proof for w_L^O and w_H^O, the optimal wages for the outsider, where L and H denote the expenditure of low and high effort.

For the optimal wage w_L^O, the participation constraint is satisfied by equality. Using the utility function and the prescribed level of effort, $e^*(O) = e_B$, we have $\log w_L^O - e_B + I_O = \bar{u} \Leftrightarrow \log w_L^O = \bar{u} + e_B - I_O \Leftrightarrow w_L^O = \exp(\bar{u} + e_B - I_O)$. $\bar{u}$ denotes the reference utility. For the optimal wage w_H^O, the incentive compatibility constraint binds and, given that in this case the outsider chooses the high effort e_A, we have $\frac{1}{2}\log w_H^O + \frac{1}{2}\log w_L^O - e_A + I_O - t_O(e_A - e_B) = \log w_H^O - e_B + I_O$. Manipulating further, and using $\log w_L^O - e_B + I_O = \bar{u}$ from the participation constraint, we obtain $\log w_H^O = \bar{u} + e_B - I_O + 2(e_A - e_B)(1 + t_O)$, which is equivalent to $w_H^O = \exp(\bar{u} + e_B - I_O + 2(e_A - e_B)(1 + t_O))$. (Observe that if the effort is low, the outsider gets w_L^O; if the effort is high the outsider either gets w_L^O or w_H^O with an identical probability of ½.) For an outsider, the (log) difference in optimal wages w_L^O and w_H^O is therefore given by $2(e_A - e_B)(1 + t_O)$. A similar proof can be provided for w_L^N and w_H^N, the optimal wages for an insider. In this case the log difference is given by $2(e_A - e_B)(1 - t_N)$. Finally, given that $2(e_A - e_B)(1 + t_O) - 2(e_A - e_B)(1 - t_N) = 2(e_A - e_B)(t_O + t_N) > 0$ (as t_c is positive for any worker type and $e_A > e_B$), we have the main proposition that inducing a high effort is less costly in the case of an insider than in the case of an outsider.

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Table 1: Selected Management Practices and Domains

Domains	Items
1-Work organization practices and monitoring (3 items)	Use of information systems; monitoring of quality of production processes or service delivery; monitoring of external ideas or technological developments.
2-Team working (1 item)	Use of groups of people working together with a shared responsibility and varying degree of autonomy.
3-Performance appraisal (1 item)	Proportion of performance appraisal or evaluation interview.
4-Incentive /performance-based pay (5 items)	Use of payment by results; extra pay linked to the individual performance; performance of the team; results of the company (profit sharing); and ownership schemes.
5-Employee involvement (7 items)	Use of practices designed to involve employees in how work is organized (regular meetings, regular staff meetings; meetings of a temporary group/committee/ad-hoc group; dissemination of information through newsletters, website, notice boards, email; discussions with employees through social media or in online discussion; suggestion schemes, and employee surveys among employees).
6-Skill development/training (3 items)	Proportion of employees who receive paid on- an off-the-job training; percentage of employees who receive on-the-job training; percentage of employees working in jobs which require at least one year of on the job learning in order to become proficient in his/her task.
7-Provision of information to employees and participation in decision making (1 item)	Information in the case of a major change in the establishment and involvement in decision making.

Note: A full description of each item is given in Appendix Table 1.

Table 2: Management Practices by Type of Workplace Representation

Type of worker representation		Unweighted average of *z*-scores			Sum of raw scores			
		Overall management practice index (domains 1 to 5)	Single-domain index (Incentive/performance-based pay; domain 4)	Single-domain index (Employee involvement; domain 5)	Overall management practice index (domains 1 to 5)			
	%	(1)	(2)	(3)	(4)			
					Mean	p25	p50	p75
None	51.7	-0.123 (0.484)	-0.104 (0.603)	-0.136 (0.543)	12.148 (5.008)	8	12	16
Union-only	12.2	0.083 (0.443)	0.026 (0.646)	0.116 (0.506)	14.416 (4.590)	11	15	18
Works council type only	20.6	0.138 (0.438)	0.142 (0.643)	0.123 (0.504)	14.948 (4.516)	12	16	18
Both	15.5	0.170 (0.423)	0.150 (0.672)	0.206 (0.492)	15.318 (4.378)	12	16	19
All establishments	100	0.001 (0.479)	0.002 (0.638)	0.0008 (0.542)	13.493 (4.970)			
N	24,470	24,470	24,295	24,455	24,471			

Notes: The overall index in column (1) is a simple (unweighted) average over the computed *z*-scores for individual domains 1 through 5. Columns (2) and 3 give the unweighted average of z-scores over all items contained in domains 4 and 5, respectively. The mean in column (4) is the simple average sum of raw scores, where p25, p50 and p50 denote the 25, 50 and 75 quantiles, respectively. By construction, the average in columns (1) to (3) is approximately zero. The standard deviation is given in parentheses. In all four columns of the table, the null on the equality of means across *None* and *Union only* is always rejected at the 0.01 level; and similarly for *None* and *Works council type only* and *None* and *Both*.

Source: 2013 European Company Survey.

Table 3: Establishment Performance and Management Practices

	Outcome (Establishment performance)									
	A. Financial situation						B. Labor productivity growth			
	Coefficient	Marginal effects (outcome-category in ascending order)					Coefficient	Marginal effects (outcome-category in ascending order)		
Variable		1	2	3	4	5		1	2	3
1. Model with overall management practice index based on domains 1 to 5										
Single index	0.529*** (0.032)	-0.006*** (0.001)	-0.032*** (0.003)	-0.079*** (0.005)	0.062*** (0.007)	0.055*** (0.005)	0.653*** (0.033)	-0.064*** (0.005)	-0.092*** (0.006)	0.156*** (0.008
N	20,803						20,673			
2. Model with overall management practice index based on domains 1 to 5 and 7										
Single index	0.555*** (0.043)	-0.007*** (0.001)	-0.035*** (0.004)	-0.082*** (0.006)	0.063*** (0.008)	0.061*** (0.006)	0.618*** (0.044	-0.062*** (0.006)	-0.085*** (0.006)	0.148*** (0.010)
N	13,412						13,375			

Notes: The multilevel mixed-effects ordered logistic model is given in equation (4) in the text, and is estimated using the *meologit* command in Stata 15. The table reports both the estimated coefficients and mean marginal effects. Control variables include: sector affiliation, establishment size, single versus multi-establishment organization, workforce composition by skill and occupation, and collective agreement status. A full description of all variables is provided in Appendix Table 3. The log-likelihood ratio statistics, not reported in the table, are equal to 1189.44 (p-value: 0.000) and 732.36 (p-value: 0.000) in row 1; and 680.14 (p-value: 0.000) and 440.69 (p-value: 0.000) in row 2; in all cases the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic model. *** denotes statistical significance at the 0.01 level; standard errors are given in parentheses.
Source: 2013 European Company Survey.

Table 4: The Determinants of Worker Commitment

Variables	Worker commitment			
	Model with the overall management practice index based on domains 1 to 5 (1)		Model with the overall management practice index based on domains 1 to 5 and 7 (2)	
	Coefficient	Marginal effect	Coefficient	Marginal effect
Overall index	0.462***	0.071***	0.736***	0.121***
	(0.042)	(0.007)	(0.055)	(0.010)
Public services sector	0.251***	0.039***	0.286***	0.047***
	(0.063)	(0.010)	(0.074)	(0.012)
Establishment size (Ref. category: 10 to 49 employees)				
With 50-249 employees	-0.384***	-0.059***	-0.362***	-0.059***
	(0.041)	(0.007)	(0.050)	(0.008)
With at least 250 employees	-0.449***	-0.071***	-0.438***	-0.072***
	(0.055)	(0.010)	(0.064)	(0.012)
Single establishment	0.090**	0.014**	0.103**	0.017**
	(0.041)	(0.006)	(0.049)	(0.008)
Collective agreement (Ref. category: no collective agreement)				
Company level	-0.097	-0.015	-0.130*	-0.021*
	(0.059)	(0.009)	(0.073)	(0.012)
Higher than company level	-0.097*	-0.015*	-0.064	-0.010
	(0.057)	(0.009)	(0.068)	(0.011)
Mixed level	-0.115*	-0.018*	-0.079	-0.013
	(0.061)	(0.009)	(0.073)	(0.012)
Workforce composition				
Workers with an OEC	-0.000	-0.00007	-0.001	-0.0002
	(0.001)	(0.0001)	(0.001)	(0.0002)
Female workers	-0.000	-0.00003	-0.001	-0.00008
	(0.001)	(0.0001)	(0.001)	(0.0002)
Workers with a university degree	0.004***	0.001***	0.003***	0.001***
	(0.001)	(0.0001)	(0.001)	(0.0002)
Part-time workers	-0.003***	-0.0005***	-0.002*	-0.0004*
	(0.001)	(0.0002)	(0.001)	(0.0002)
N	21,045		13,510	

Notes: The multilevel mixed-effects logistic model is given in equation (5) in the text and is estimated using the *melogit* command in Stata 15. The table reports mean marginal effects. The log-likelihood ratio statistics, not reported in the table, are equal to 444.36 (p-value: 0.000) and 238.69 (p-value: 0.000) in columns (1) and (2), respectively; in both cases, the null of an ordinary logistic model is rejected against the multilevel mixed-effects logistic model. ***, **, and * denote statistical significance at the 0.01, 0.05, and 0.1 level, respectively; standard errors are given in parentheses.
Source: 2013 European Company Survey.

Table 5(a): Establishment Performance, Management Practices, and Workplace Representation (Management Practices Based on Domains 1 to 5)

Variables	Outcome (Establishment performance)									
	A. Financial situation						B. Labor productivity growth			
	Coefficient	Marginal effects (outcome-category in ascending order)					Coefficient	Marginal effects (outcome-category in ascending order)		
		1	2	3	4	5		1	2	3
Overall management practice index based on domains 1 to 5	0.569***	-0.007***	-0.035***	-0.085***	0.067***	0.060***	0.672***	-0.066***	-0.095***	0.161***
	(0.040)	(0.001)	(0.003)	(0.006)	(0.008)	(0.006)	(0.041)	(0.005)	(0.007)	(0.010)
Workplace representation:										
Union-only	-0.256***	0.003***	0.016***	0.038***	-0.030***	-0.027***	-0.100*	0.010*	0.014*	-0.024*
	(0.050)	(0.001)	(0.003)	(0.007)	(0.007)	(0.006)	(0.052)	(0.005)	(0.007)	(0.012)
Works council type-only	-0.105**	0.001**	0.006**	0.016**	-0.012**	-0.011**	-0.121***	0.012***	0.017***	-0.029***
	(0.041)	(0.000)	(0.003)	(0.006)	(0.005)	(0.004)	(0.042)	(0.004)	(0.006)	(0.010)
Both	-0.318***	0.004***	0.019***	0.048***	-0.037***	-0.033***	-0.155***	0.015***	0.022***	-0.037***
	(0.051)	(0.001)	(0.003)	(0.008)	(0.007)	(0.006)	(0.052)	(0.005)	(0.007)	(0.012)\
Interactions:										
Overall management practice*Union-only	0.046	-0.001	-0.003	-0.007	0.005	0.005	0.045	-0.004	-0.006	0.011
	(0.096)	(0.001)	(0.006)	(0.014)	(0.011)	(0.010)	(0.100)	(0.010)	(0.014)	(0.024)
Overall management practice*Works council type-only	-0.150*	0.002*	0.009*	0.022*	-0.018*	-0.016*	-0.027	0.003	0.004	-0.006
	(0.077)	(0.001)	(0.005)	(0.012)	(0.009)	(0.008)	(0.080)	(0.008)	(0.011)	(0.019)
Overall management practice*Both	-0.012	0.000	0.001	0.002	-0.001	-0.001	-0.060	0.006	0.008	-0.014
	(0.091)	(0.001)	(0.006)	(0.014)	(0.011)	(0.010)	(0.094)	(0.009)	(0.013)	(0.022)
N	20,803							20,673		

Notes: The multilevel mixed-effects ordered logistic model is given in equation (6) in the text. Control variables included: sector affiliation, establishment size, single versus multi-establishment organization, workforce composition by skill and occupation, and collective agreement status. Full description of the included variables is provided in Appendix Table 3. In column B, the joint test that the coefficients on the three interaction terms are all equal to zero is not rejected at the conventional levels; in column A, the joint test is rejected at the 0.05 level. The log-likelihood ratio statistics, not reported in the table, are equal to 1109.25 (p-value: 0.000) and 697.90 (p-value: 0.000) in columns A and B, respectively; in both cases, the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic model. ***, **, and* denote statistical significance at the 0.01, 0.05, and 0.1 levels, respectively; standard errors are given in parentheses.

Table 5(b): Establishment Performance, Management Practices, and Workplace Representation (Management Practices Based on Domains 1 to 5 and 7)

Variables	Outcome (Establishment performance)									
	A. Financial situation						B. Labor productivity growth			
	Coefficient	Marginal effects (outcome-category in ascending order)					Coefficient	Marginal effects (outcome-category in ascending order)		
		1	2	3	4	5		1	2	3
Overall management practice index based on domains 1 to 5 and 7	0.601***	-0.007***	-0.037***	-0.089***	0.068***	0.066***	0.624***	-0.063***	-0.086***	0.149***
	(0.056)	(0.001)	(0.004)	(0.008)	(0.009)	(0.007)	(0.058)	(0.007)	(0.008)	(0.014)
Workplace representation (Ref. group: None):										
Union-only	-0.295***	0.004***	0.018***	0.044***	-0.033***	-0.032***	-0.041	0.004	0.006	-0.010
	(0.061)	(0.001)	(0.004)	(0.009)	(0.008)	(0.007)	(0.064)	(0.006)	(0.009)	(0.015)
Works council type-only	-0.063	0.001	0.004	0.009	-0.007	-0.007	-0.128**	0.013**	0.018**	-0.031**
	(0.051)	(0.001)	(0.003)	(0.008)	(0.006)	(0.006)	(0.053)	(0.005)	(0.007)	(0.013)
Both	-0.317***	0.004***	0.020***	0.047***	-0.036***	-0.035***	-0.152**	0.015**	0.021**	-0.036**
	(0.061)	(0.001)	(0.004)	(0.009)	(0.008)	(0.007)	(0.063)	(0.006)	(0.009)	(0.015)
Interactions:										
Overall management practice*Union-only	0.145	-0.002	-0.009	-0.021	0.016	0.016	0.114	-0.011	-0.016	0.027
	(0.128)	(0.002)	(0.008)	(0.019)	(0.014)	(0.014)	(0.135)	(0.014)	(0.019)	(0.032)
Overall management practice*Works council type-only	-0.264**	0.003**	0.016**	0.039**	-0.030**	-0.029**	-0.052	0.005	0.007	-0.012
	(0.105)	(0.001)	(0.007)	(0.015)	(0.012)	(0.012)	(0.109)	(0.011)	(0.015)	(0.026)
Overall management practice*Both	-0.022	0.000	0.001	0.003	-0.003	-0.002	-0.018	0.002	0.002	-0.004
	(0.117)	(0.001)	(0.007)	(0.017)	(0.013)	(0.013)	(0.121)	(0.012)	(0.017)	(0.029)
N	13,412						13,375			

Notes: See notes to Table 5a. In column B, the joint test that the coefficients on the three interaction terms are all equal to zero is not rejected; in column A, the joint test is rejected at the 0.05 level. The log-likelihood ratio statistics, not reported in the table, are equal to 626.15 (p-value: 0.000) and 419.75 (p-value: 0.000) in columns A and B, respectively; in both cases, the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic model. *** and ** denote statistical significance at the 0.01 and 0.05 levels, respectively; standard errors are given in parentheses.

Table 6: Establishment Performance, Worker Commitment and Workplace Representation

Variables	Outcome (Establishment performance)									
	A. Financial situation						B. Labor productivity growth			
	Coefficient	Marginal effects (outcome-category in ascending order)					Coefficient	Marginal effects (outcome-category in ascending order)		
		1	2	3	4	5		1	2	3
Worker motivation	0.890***	-0.010***	-0.053***	-0.130***	0.100***	0.094***	0.588***	-0.058***	-0.084***	0.142***
	(0.047)	(0.001)	(0.005)	(0.007)	(0.011)	(0.008)	(0.049)	(0.006)	(0.008)	(0.012)
Workplace representation (Ref. group: None):										
Union-only	-0.308***	0.004***	0.018***	0.045***	-0.034***	-0.032***	-0.005	0.001	0.001	-0.001
	(0.095)	(0.001)	(0.006)	(0.014)	(0.011)	(0.010)	(0.098)	(0.010)	(0.014)	(0.024)
Works council type-only	0.050	-0.001	-0.003	-0.007	0.006	0.005	0.035	-0.003	-0.005	0.008
	(0.084)	(0.001)	(0.005)	(0.012)	(0.009)	(0.009)	(0.086)	(0.008)	(0.012)	(0.021)
Both	-0.345***	0.004***	0.021***	0.050***	-0.039***	-0.036***	-0.115	0.011	0.016	-0.028
	(0.087)	(0.001)	(0.005)	(0.013)	(0.010)	(0.009)	(0.090)	(0.009)	(0.013)	(0.022)
Interactions:										
Worker commitment*Union-only	0.144	-0.002	-0.009	-0.021	0.016	0.015	-0.052	0.005	0.007	-0.013
	(0.104)	(0.001)	(0.006)	(0.015)	(0.012)	(0.011)	(0.107)	(0.011)	(0.015)	(0.026)
Worker commitment*Works council type-only	-0.127	0.001	0.008	0.019	-0.014	-0.013	-0.102	0.010	0.015	-0.025
	(0.090)	(0.001)	(0.005)	(0.013)	(0.010)	(0.009)	(0.092)	(0.009)	(0.013)	(0.022)
Worker commitment*Both	0.172*	-0.002*	-0.010*	-0.025***	0.019*	0.018*	0.076	-0.008	-0.011	0.018
	(0.094)	(0.001)	(0.006)	(0.014)	(0.011)	(0.010)	(0.097)	(0.010)	(0.014)	(0.023)
N	20,491						20,367			

Notes: The multilevel mixed-effects ordered logistic model is given in equation (7) in the text. In column B, the joint test that the coefficients on the three interaction terms are all equal to zero is not rejected; in column A, the joint test is rejected at the 0.05 level. The log-likelihood ratio statistics, not reported in the table, are equal to 1090.78 (p-value: 0.000) and 898.03 (p-value: 0.000) in columns A and B, respectively; in both cases, the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic model. *** and * denote statistical significance at the 0.01 and 0.1 levels, respectively; standard errors are given in parentheses.

Table 7: Establishment Performance and Management Practices Using Raw Scores

	Outcome (Establishment performance)	
	A. Financial situation	B. Labor productivity growth
Variable	Coefficient	Coefficient
1. Model with overall management practice index based on raw scores in domains 1 to 5		
Single index	0.055*** (0.003)	0.065*** (0.003)
N	20,803	20,673
2. Model with overall management practice index based on raw scores in domains 1 to 5 and 7		
Single index	0.059*** (0.004)	0.060*** (0.004)
N	13,412	13,375

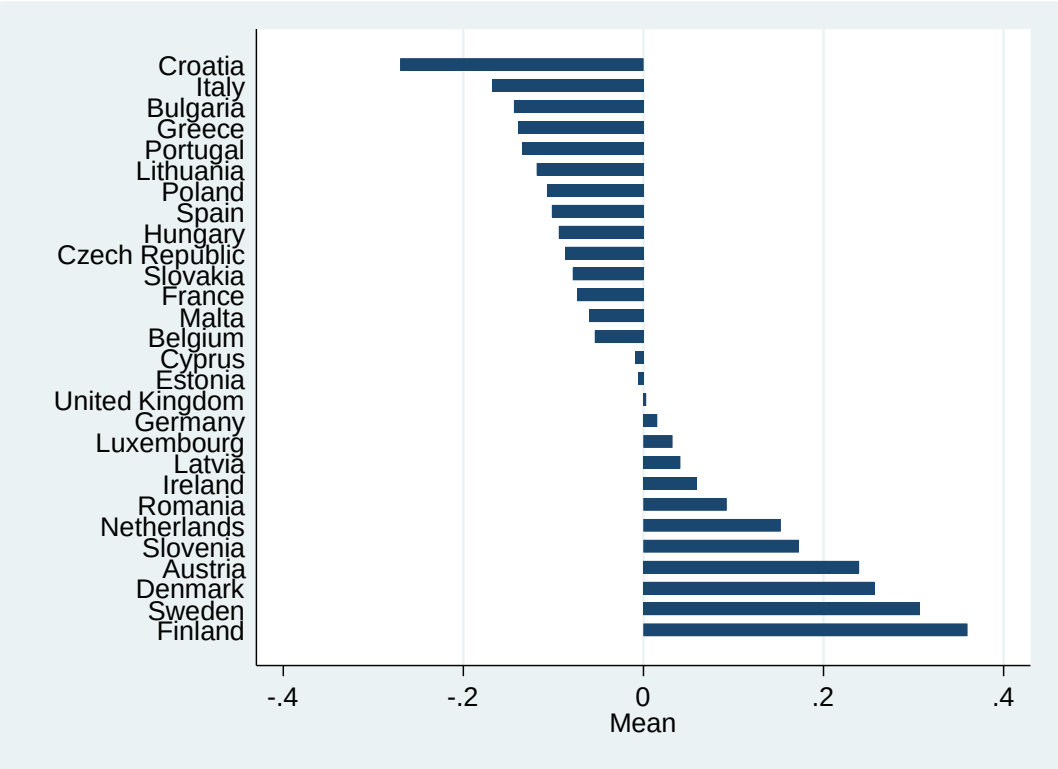
Notes: See notes to Table 3. The log-likelihood ratio statistics, not reported in the table, are equal to 1172.30 (p-value: 0.000) and 719.93 (p-value: 0.000) in row 1, and 648.46 (p-value: 0.000) and 421.84 (p-value: 0.000) in row 2; in all cases, the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic model. *** denotes statistical significance at the 0.01 level; standard errors are given in parentheses.

Table 8: Establishment Performance and Management Practices Using Separate Domains

Variables	Outcome (Establishment performance)	
	A. Financial situation	B. Labor productivity growth
	Coefficient	Coefficient
A. Five separate domains (1 to 5) in a single regression		
Domain 1: Work organization practices and monitoring	0.144 (0.022)***	0.172 (0.023)***
Domain 2: Team working	0.008 (0.014)	0.067 (0.014)***
Domain 3: Performance appraisal	0.123 (0.015)***	0.084 (0.016)***
Domain 4: Incentive /performance-based pay	0.199 (0.024)***	0.197 (0.025)***
Domain 5: Employee involvement	0.149 (0.031)***	0.261 (0.031)***
N	20,293	20,170
B. Six separate domains (1 to 5 and 7) in a single regression		
Domain 1: Work organization practices and monitoring	0.149 (0.028)***	0.151 (0.029)***
Domain 2: Team working	-0.001 (0.018)	0.080 (0.019)***
Domain 3: Performance appraisal	0.147 (0.019)***	0.074 (0.020)***
Domain 4; Incentive /performance-based pay	0.227 (0.030)***	0.174 (0.031)***
Domain 5: Employee involvement	0.147 (0.039)***	0.249 (0.041)***
Domain 7: Provision of information to employees and participation in decision making	0.015 (0.017)	0.024 (0.017)
N	13,116	13,082
C. Separate regressions by domain		
(C.1) Domain 1: Work organization practices and monitoring	0.227*** 0.021 N=20,795	0.272*** 0.021 N=20,667
(C.2) Domain 2: Team working	0.054*** 0.014 20,479	0.119*** 0.014 20,352
(C.3) Domain 3: Performance appraisal	0.181*** 0.014 20,673	0.169*** 0.015 20,547
(C.4) Domain 4: Incentive /performance-based pay	0.275*** 0.023 N=20,748	0.307*** 0.024 20,614
(C.5) Domain 5: Employee involvement	0.314*** 0.028 20,794	0.434*** 0.029 20,665
(C.6) Domain 7: Provision of information to employees and participation in decision making	0.052*** 0.017 13,412	0.069*** 0.017 13,375

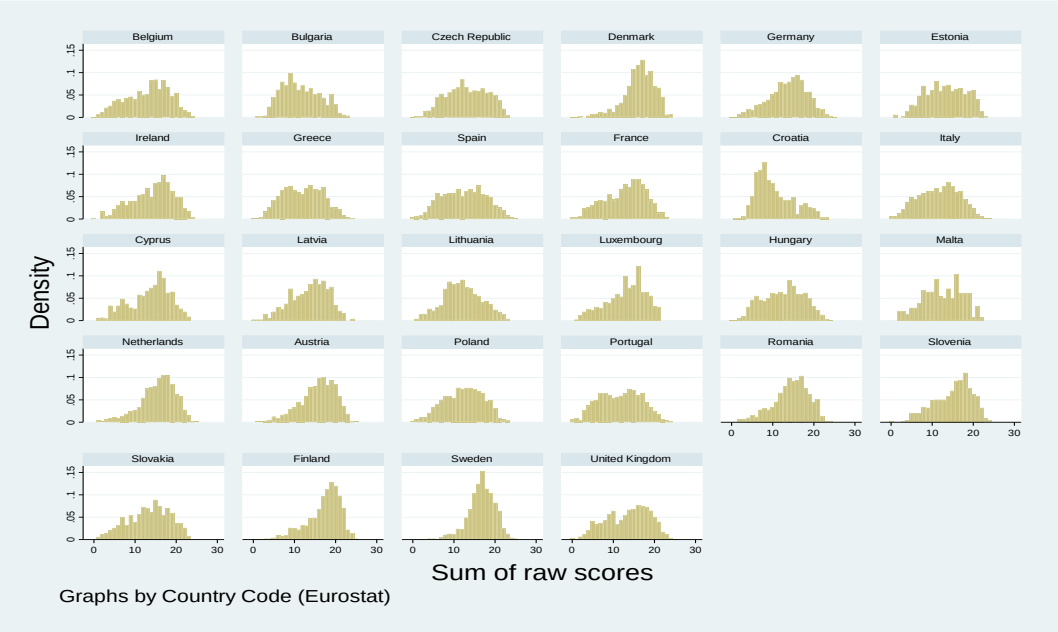
Notes: See notes to Table 3. In all cases, the null of an ordinary ordered logistic model is rejected against the multilevel mixed-effects ordered logistic model. *** denotes statistical significance at the 0.01 level; standard errors are given in parentheses.

Figure 1: Overall Index of Management Practices across Countries



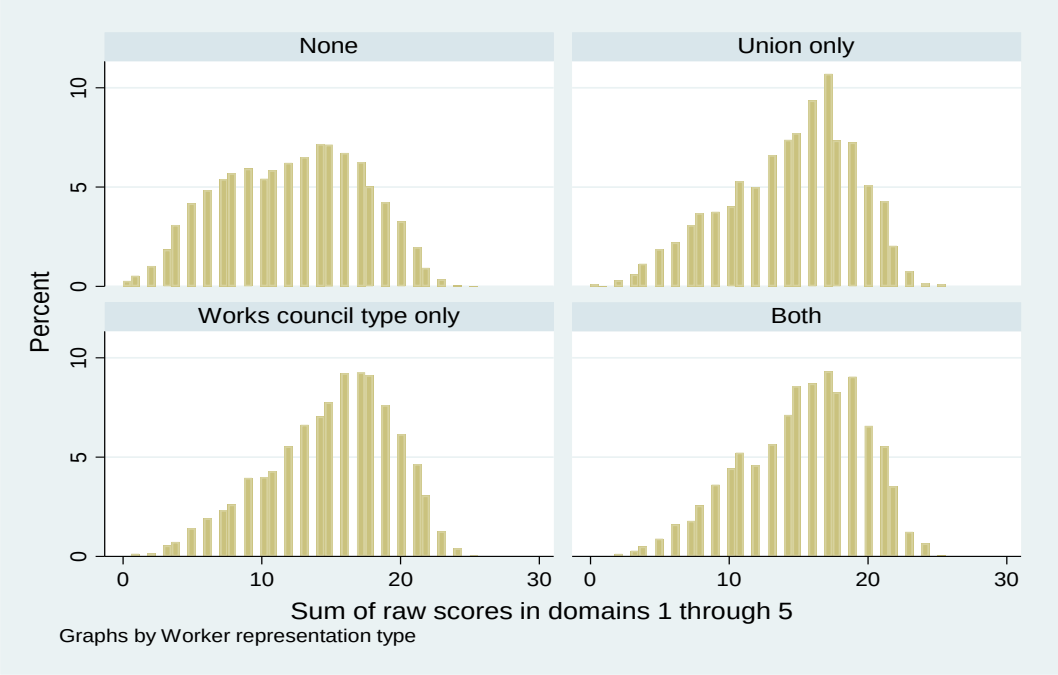
Notes: The overall index is obtained by taking the unweighted average over the computed z-scores on separate domains 1 through 5. For domains 1, 4, and 5, which contain more than 1 item, the corresponding z-score is a simple average over all domain-specific items. By construction, the overall index increases with the use of individual items. The contents of each domain are described in Table 1. A country in which all items are absent will score the lowest index; conversely, a high score indicates that the selected items were extensively used. See section 4 for further description of our procedures.

Figure 2: Distribution of Management Practices across Countries Using Overall Raw Scores



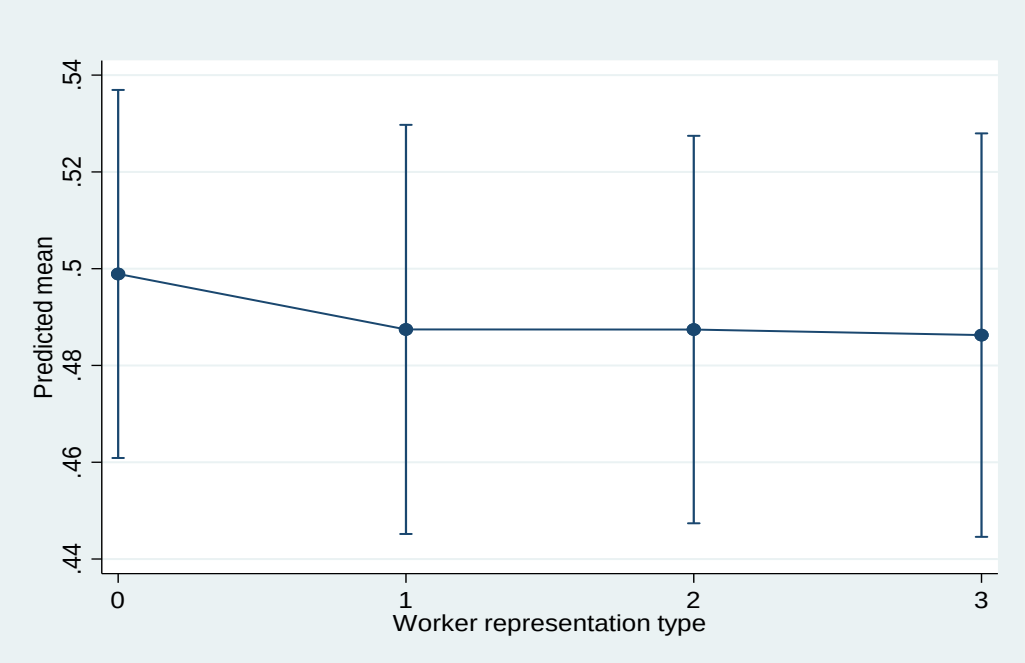
Notes: In each country and for each establishment we compute the sum of raw scores across all selected practices in domains 1 through 5. A sum of zero in a given establishment indicates that the selected practices are absent; 25 is the maximum score and indicates that the best practices were adopted throughout.

Figure 3: Distribution of Management Practices by Workplace Representation Type, in Percent



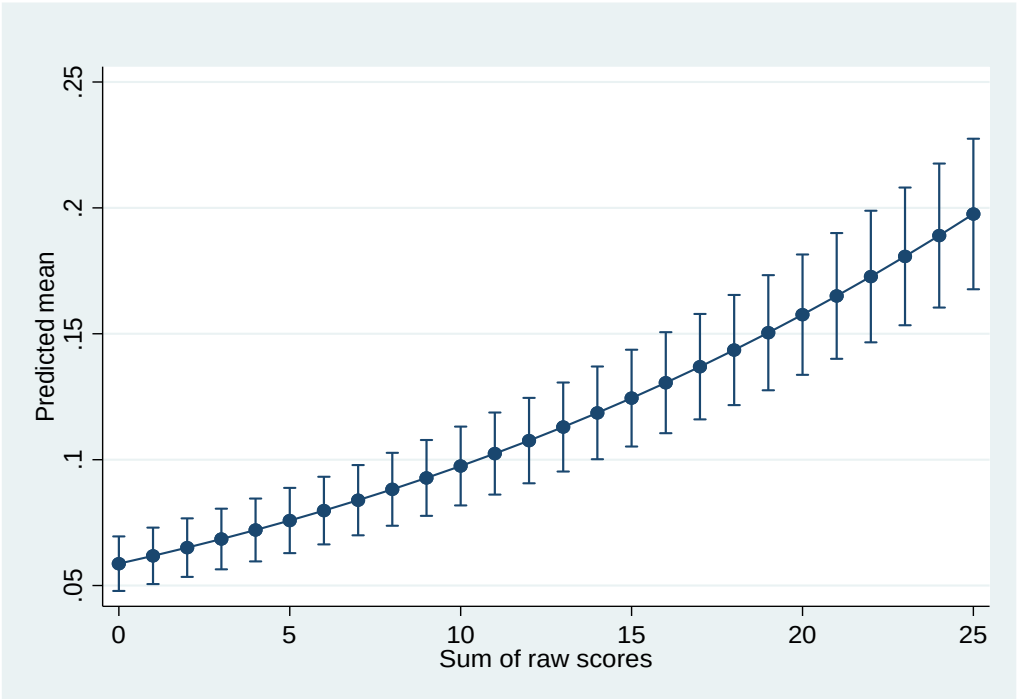
Note: See notes to Figure 2.

Figure 4: Predicted Probability of Positive Labor Productivity Growth, by Worker Representation Type



Notes: The numbers 0, 1, 2, and 3 on the X-axis denote the four types of worker representation: None, Union-only, Works council type only, and Both, respectively. The vertical bars indicate the corresponding 95% confidence intervals. The predicted means are based on the estimates reported in Table 6.

Figure 5: Predicted Probability of the Highest Financial Performance Using Overall Raw Scores (Domains 1 through 5)



Notes: See notes to Figure 2. The vertical bars indicate the corresponding 95% confidence intervals. The predicted mean is based on the estimates reported in Table 7.

Appendix Table 1: Description of the Selected Management Practices

Domain	Items	Survey variable in the raw dataset	Description
1-Work organization practices and monitoring (three items)	Use of information systems	EINFSYS	0-1 ordinal variable in ascending order: 0 if establishment does not use information systems to minimize supplies or work-in-process; 1 otherwise. (These practices are sometimes known as just-in-time or lean production systems or as working according to a zero buffer principle.)
	Monitoring of production processes	EMONQUA	0-2 ordinal variable in ascending order: 0 if establishment does not monitor the quality of its production processes or service delivery; 1 if it does intermittently; 2 if it does on a continuous basis.
	Monitoring of external ideas	EEXTEMON	0-2 ordinal variable in ascending order: 0 if establishment does not monitor external ideas or technological developments for new or changed products, processes or services; 1 if it is a part of the responsibilities of general staff; 2 if it does using staff assigned specifically to this task.
2-Team work (1 item)	Team work	FTEAMEX and FTAUTON	0-2 ordinal variable in ascending order: 0 if no team is present; 1 if tasks to be performed by the team are distributed by a superior; 2 if there is a team and team members decide among themselves. Note: A team is a group of people working together with a shared responsibility for the execution of allocated tasks, within or across units of the establishment.
3-Performance appraisal (1 item)	Performance appraisal	HAPRAIPC	0-6 ordinal variable in ascending order: 0 if the percentage of employees who have a performance appraisal or evaluation interview at least once a year is 0%; 1 if less than 20%; 2 if 20 to 39%; 3 if 40 to 59%; 4 if 60 to 79%; 5 if 80 t0 99; 6 if 100%.
4-Incentives/performance-based pay (5 items)	Payment by results	HVBPRES	0-1 ordinal variable in ascending order: 1 if payment by results, for example piece rates, provisions, brokerages or commissions; 0 otherwise.
	Extra pay linked to individual performance	HVPINPER	0-1 ordinal variable in ascending order: 1 if variable extra pay linked to the individual performance following management appraisal; 0 otherwise.
	Extra pay linked to team performance	HVPGRPE	0-1 ordinal variable in ascending order: 1 if extra pay linked to the performance of the team, working group or department; 0 otherwise.
	Profit sharing	HVPPRSH	0-1 ordinal variable in ascending order: 1 if variable extra pay linked to the results of the company or establishment (profit sharing scheme); 0 otherwise.
	Ownership scheme	HVPSHOW	0-1 ordinal variable in ascending order: 1 if variable extra pay in form of share ownership scheme offered by the company; 0 otherwise.
5-Employee involvement (7 items)	Regular meetings	E1_A	0-1 ordinal variable in ascending order: 1 if regular meetings between employees and immediate manager; 0 otherwise.
	Regular staff meetings	E1_B	0-1 ordinal variable in ascending order: 1 if regular staff meetings open to all employees at the establishment: 0 otherwise.
	Ad hoc groups	E1_C	0-1 ordinal variable in ascending order: 1 if meetings of a temporary group or committee or ad-hoc group; 0 otherwise.
	Newsletters, website and email	E1_D	0-1 ordinal variable in ascending order: 1 if dissemination of information through newsletters, website, notice boards, email, etc.; 0 otherwise.

	Social media	E1_E	0-1 ordinal variable in ascending order: 1 if discussions with employees through social media or in online discussion boards; 0 otherwise.
	Suggestion schemes	E1_F	0-1 ordinal variable in ascending order: 1 if suggestion schemes (the collection of ideas and suggestions from the employees, voluntary and at any time, traditionally by means of a 'suggestion box'); 0 otherwise.
	Employee surveys	E1_G	0-1 ordinal variable in ascending order: 1 if employee surveys among employees; 0 otherwise.
6-Skill development/training (3 items)	Paid on- an off-the job training	qh13	0-6 ordered variable in ascending order: 0 if the percentage of employees who receive paid on- an off-the job training is 0%; 1 if less than 20%; 2 if 20 to 39%; 3 if 40 to 59%; 4 if 60 to 79%; 5 if 80 t0 99; 6 if 100%.
	On-the-job training	qh15	0-6 ordered variable in ascending order: 0 if the percentage of employees who receive on-the-job training is 0%; 1 if less than 20%; 2 if 20 to 39%; 3 if 40 to 59%; 4 if 60 to 79%; 5 if 80 t0 99; 6 if 100%.
	Job learning for proficiency	q16	0-6 ordered variable in ascending order: 0 if the percentage of employees in jobs which require at least one year of on the job learning in order to become proficient in his/her task.is 0%; 1 if less than 20%; 2 if 20 to 39%; 3 if 40 to 59%; 4 if 60 to 79%; 5 if 80 t0 99; 6 if 100%.
7- Provision of information to employees and participation in decision making (1 item)	Information and participation	E0C_A, E0C_B and E0C_C	0-2 ordered variable in ascending order: 1 if employees have not been informed in case of a major change in the establishment; 2 if employees were just informed by management; 3 if employees were more than informed by management (i.e. if employees were asked to give their views ahead of the decision and eventually involved in join decision making with management) This variable is restricted to the sample of establishments in which at least one major change has taken place in the last three years.

Appendix Table 1 (cont.): Distribution of Management Practices, in Percent

Domain	Item	Percentage in each category						
		0	1	2	3	4	5	6
1-Work organization practices and monitoring	Use of information systems	48	52					
	Monitoring of production processes	6	14	80				
	Monitoring of external ideas	23	45	32				
2-Team work	Team work	20	60	20				
3-Performance appraisal	Performance appraisal	25	6	7	6	4	6	47
4-Incentive/performance-based pay	Payment by results	60	40					
	Extra pay linked to individual performance	49	51					
	Extra pay linked to team performance	67	33					
	Profit sharing	62	38					
	Ownership scheme	93	7					
5-Employee involvement	Regular meetings	12	88					
	Regular staff meetings	39	61					
	Ad hoc groups	46	54					
	Newsletters, website and email	23	77					
	Social media	85	15					
	Suggestion schemes	51	49					
	Employee surveys	54	46					
6-Skill development/training	Paid on- an off-the job training	23	25	16	9	5	6	15
	On-the-job training	21	22	16	10	6	6	20
	Job learning for proficiency	35	17	12	9	6	8	13
7-Provision of information to employees and participation in decision making	Information and participation in decision making	8	34	58				

Note: The reported shares were computed using the estimation sample in Table 3, column A.

Appendix Table 2: Mapping Workplace Formal Employee Representation to Establishments and Countries

Country	Trade union representation	Works council type of representation
BE-Belgium	Délégation syndicale	Conseil d'entreprises (ERTYPE_B) Comité pour la prevention et de la protection au travail (ERTYPE_E)
BG-Bulgaria	Синдикална организация	ERTYPE_D
CZ-Czech Rep.	Odborová organizasse	Rada zaměstnanců (ERTYPE_B)
DK-Denmark	Tillidsrepræsentant	Samarbejdsudvalg (ERTYPE_B)
DE-Germany	No trade union representation	Betriebsrat (ERTYPE_B) Personalrat (ERTYPE_F)
EE-Estonia	Ametiühing	Töötajate usaldusisik (ERTYPE_D)
IE-Ireland	Workplace trade union representative	Statutory employee representative (ERTYPE_B) Joint consultative committee (ERTYPE_C)
EL-Greece	Επιχειρησιακό σωματείο	Συμβούλιο εργαζομένων (ERTYPE_B)
ES-Spain	Sección syndical	Comité de empresa (ERTYPE_B)
FR-France	Délégué syndical	Comité d'entreprise (ERTYPE_B) Délégué du personnel (ERTYPE_D)
IT-Italy	Rappresentanza sindicale aziendale	Rappresentanza sindacale unitária (ERTYPE_B)
CY-Cyprus	Συνδικαλιστική Εκπροσώπηση	No works council-type representation
LV-Latvia	arodbiedrība	Darbinieku pilnvarotie pārstāvji (ERTYPE_D)
LT-Lituania	Profesinė sąjunga	Darbo taryba (ERTYPE_B)
LU-Luxembourg	No trade union representation	Comité mixte (ERTYPE_B) Délégation du personnel (ERTYPE_E)
HU-Hungary	Szakszervezet (bizalmi)	Üzemi tanács (ERTYPE_B) Üzemi megbízott (ERTYPE_E)
MT-Malta	Shop steward (recognized union representative)	No works council-type representation
NL-Netherlands	No trade union representation	Ondernemingsraad (ERTYPE_B) Personeelsvertegenwoordiging (ERTYPE_E)
AT-Austria	No trade union representation	Betriebsrat (ERTYPE_B)
PL-Poland	Zakladowa organizacja zwiazkowa	Rada pracowników (ERTYPE_B)
PT-Portugal	Comissão sindical or Comissão intersindical	Comissão de trabalhadores (ERTYPE_B)
RO-Romania	Sindicat	Reprezentanţii salariaţilor (ERTYPE_E)
SI-Slovenia	Sindikalni zaupnik	Svet delavcev (ERTYPE_B) Delavski zaupnik (ERTYPE_D)
SK-Slovakia	Odborová organizácia	Zamestnaneckárada (ERTYPE_B) Zamestnanecky dôvernik (ERTYPE_D)
FI-Finland	Ammattiosasto	YT-toimikunta (ERTYPE_B) Henkilöstön edustaja (ERTYPE_E)
SE-Sweden	Facklig förtroendeman	No works council representation
UK-United Kigdom	Recognised shopfloor trade union representation	Joint consultative committee (ERTYPE_C)
HR-Croatia	Sindikat	Radnicko vijece (ERTYPE_B)

Notes: The mapping is based on the raw information on the type of workplace representation available in the Management Questionnaire. Supplementary information was taken from the 2013 ECS technical report. The dataset includes 7 raw employee representation groups. Typically, group 1 flags a formal union representation, while groups 2 and 3 identify formal works council-type agencies. In general, groups 4-7 comprise informal union and non-union worker representation. In practice, union workplace representation is exclusively based on the raw dummy variables ERTYPE_A. The basis for the construction of the works council dummy is given by the raw variables ERTYPE_B. In some countries these variables were supplemented by the information based on variables ERTYPE_C-ERTYPE_F. In this case, no general rule could be adopted as the codes vary from country to country and over time. We also note that due to the fact that the raw ERTYPE_C-ERTYPE_F variables do not have exactly the same meaning across countries, finding a consistent measure of a formal ER body is fraught. To reduce the margin of error, in all cases in which we were not sure whether the works council-type agency was a formal employee representation body, we exclusively used the variables ERTYPE_B as the basis for the trade union and works council-type representation. The variables ERTYPE_A through ERTYPE_F are documented in the file *7735_reports.pdf* (pp. 259-263), available at the U.K. Data Service site.
Sources: The third (2013) European Community Survey and corresponding technical reports.

Appendix Table 3: Definition of the Overall Management Practice Indexes, Establishment Performance and Control Variables

Variables	Survey variable in the raw dataset	Definition
Overall management practice:		
Overall management practice index (domains 1 to 5)		It is given by the unweighted average over the z-scores on individual domains 1 through 5.
Overall management practice index (domains 1 to 5 and 7)		It is given by the simple unweighted average over the z-scores on individual domains 1 through 5 and 7.
Overall management practice index (based on raw scores in domains 1 to 5)		It is given be the sum over all raw scores in domains 1 to 5. The variable is contained in the 0-25 closed interval.
Overall management practice index (based on raw scores in domains 1 to 5 and 7)		It is given be the sum over all raw scores in domains 1 to 5 and 7. The variable is contained in the 0-27 closed interval.
Performance:		
Financial situation	KFINAN	Ordered variable in a 1 to 5 scale: 1 is the lowest level.
Labor productivity growth	KLABPRCH	Ordered variable in a 1 to 3 scale: 1 is the lowest level. Establishment's current labor productivity is compared to the situation three years earlier.
Worker identification	KOLOMOT	1/0 dummy: 0 if motivation of employees is low.
Workplace representation:		
None		1/0 dummy: 1 if neither a union nor a works council agency is present at the workplace.
A trade union representation only		1/0 dummy: 1 if there is a unique union agency at the workplace.
A works council-type representation only		1/0 dummy: 1 if there is a unique works council agency at the workplace.
Both		1/0 dummy: 1 if both entities (union and works council) are present.
Collective agreement:	Er12	
No collective agreement		1/0 dummy: Individual agreement (i.e. no collective agreement).
Company level		1/0 dummy: Company level agreement.
Higher than company level		1/0 dummy: Higher than company level agreement.
Mixed level		1/0 dummy: Mixed-level agreement (i.e. company level and higher than company level).
Workforce composition:		
Workers with an OEC	q33perm	Percentage of employees who have an open-ended contract (OEC).
Female workers	q33wom	Percentage of employees who are female.
Workers with a university degree	q33univ	Percentage of employees who have a university degree.
Part-time workers	q33pt	Percentage of employees who work part-time (i.e. less than the usual full-time arrangement).
Single establishment	ASINGLE	1/0 dummy: 1 if single independent company or organization.

Public sector	APRIVATE	1/0 dummy: 1 if establishment belongs to the public sector. A public-sector organization is defined as either wholly owned by the public authorities or they own more than 50%.

Notes: The dataset also comprises ten distinct sectors and three establishment size groups (10 to 49, 50 to 249 and at least 250 employees).