Human Relations
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Human Relations 2010 63: 371 originally published online 6 January 2010
DOI: 10.1177/0018726709348936

The online version of this article can be found at:
http://hum.sagepub.com/content/63/3/371

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human relations
63(3) 371–394

DOI: 10.1177/0018726709348936
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Abstract

This article explores the effects of team voice and worker representative voice, as well as their interaction, on labor productivity. We examine team voice in terms of team influence on key work-related issues and representative voice via the degree of worker representatives' influence on multiple collective voice issues. We thus build on the European tradition of examining both direct and indirect voice and their implications for valued organizational outcomes. We find that neither type of voice bears a significant relationship to labor productivity when examined solely but that team voice significantly contributes to enhanced worker efficiency when considered in conjunction with representative voice. In examining the interaction of the two types of voice, we find that a combination of low team and low representative voice leads to inferior labor efficiency compared to other conditions. We also find a negative interaction between team voice and worker representative voice, supporting an interpretation that these types of voice do not complement each other with respect to worker productivity. The positive impact of each type of voice is significantly stronger at low levels of the other type of voice.

Keywords

comparative management, continuous improvement, employee involvement, employee representation, employee voice, industrial relations, labor relations

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Introduction

Giving employees greater influence over how they undertake their work and encouraging their input in decision-making is believed to be beneficial for both employees and employers. Studies focused on employee involvement have emphasized employees' discretion in carrying out job tasks and making workplace decisions through a variety of work organization innovations including teams and quality circles (e.g. Black and Lynch, 2004; Cooke, 1994; MacDuffie, 1995a, 1995b; Marchington and Wilkinson, 2000; Wood, 1996). However, the employee involvement studied is often restricted to employees' direct participation in day-to-day operations, through discovery, diagnosis and resolution of problems related to workplace issues, that is, upward problem-solving. The ways in which workers participate in more strategic and organization-wide decisions through various institutions and mechanisms of worker representation (e.g. unions, works councils) are often ignored in this literature.

This interest in non-union forms of employee voice coincides with the decline in unionism in a number of industries and countries. There is some evidence that in the UK at least, there has been a switch away from representative voice (be it union or non-union), towards direct employee involvement (Bryson, 2004). Drawing on the British Workplace Employee Relations Survey (WERS), Bryson finds that the fraction of UK workplaces relying solely on direct voice rose from 11 to 30 percent between 1984 and 1998, while the fraction relying on union mediated voice alone fell from 24 to 9 percent. Other research in Europe has considered this issue from a policy perspective, aimed at understanding the distribution of influence and power in organizations (Heller, 1998; IDE, 1981, 1993). These initiatives investigated the hypothesis that American firms achieved superior economic performance as a consequence of allowing more extensive worker influence (Heller, 1998); however, they found little evidence of any such connection.

In turn, the literature on economic effects of unions and other forms of representative voice has viewed direct participation by workers in management-organized voice activities with skepticism, assuming such activities were either aimed at reducing worker commitment to unions, or as superficial and unlikely to persist. Only recently have more researchers treated direct and indirect voice as viable alternatives and considered their interrelationship (e.g. Doucouliagos and Laroche, 2003; Dundon et al., 2004; Pyman et al., 2006).

In this article, we contrast direct and representative forms of employee voice and their effects on labor efficiency by looking at a targeted sector: the global automotive industry – an industry where the connections between direct and indirect voice and efficiency have been widely debated. An advantage of studying voice in the auto sector is that both direct and representative voice are well understood and diffused. Collective bargaining and other forms of worker representation (i.e. work councils, joint labor-management committees) prevail at most firms (MacDuffie, 1995b). Meanwhile, the diffusion of lean production has promoted the widespread (though unevenly distributed) adoption of more direct forms of employee voice and input such as work teams, off-line problem-solving groups, and suggestion programs (MacDuffie, 2003; Pil and MacDuffie, 1996).

In this study, we choose team voice as the proxy for direct participation. While direct participation can occur through a variety of mechanisms (e.g. two-way briefing groups;

suggestion systems), work teams represent the most significant commitment of managerial and financial resources to eliciting direct employee voice. Most studies to date measure only the presence of teams (Addison and Belfield, 2004; Cooke, 1994; Fiorito, 2001; Ichniowki et al., 1997; Machin and Wood, 2005; Wood, 1996) or the percentage of employees in teams (Batt et al., 2002; Black and Lynch, 2004; Cappelli and Newmark, 2001; MacDuffie, 1995a; Osterman, 2000). In contrast, we choose to measure direct employee voice in terms of teams' influence on multiple work-related issues, building on literature (cited below) that identifies team-level voice as both conceptually distinct from individual-level voice and also predictive of performance outcomes.

Similarly, while many prior studies assess worker representative voice by the presence of unions or union density (Addison and Belfield, 2004; Black and Lynch, 2004; Cooke, 1994), we measure worker representatives' influence on several areas, including the allocation of work tasks, technological change, restructuring of jobs, and outsourcing. Additionally, we explore whether team voice and representative voice are complements or substitutes with respect to labor productivity.

Throughout this introduction, we have emphasized collective voice rather than individual voice. We treat both teams (direct) and representative (indirect) voice as group level concepts. Similarly, when covering related concepts (below) such as empowerment that have been studied at both individual and group levels, we will only examine literature on team-level empowerment.

Theory and hypotheses

Types of employee voice and the link to economic performance

Employee voice describes how employees raise concerns, express their interests, solve problems, and contribute to and participate in workplace decision-making (Pyman et al., 2006). Employee voice can take place either *directly* between employees and management (e.g. through employee involvement programs), or *indirectly* via worker representatives (Levine and Tyson, 1990). *Direct* employee voice refers to the degree to which individual employees or groups of employees directly influence key local establishment-level decisions that affect their day-to-day work. *Indirect* forms of employee voice exert influence on issues affecting employees and their work via employee representatives, for example, unions, works councils, joint labor-management consultation committees, and employee representation on company boards of directors. These indirect arrangements differ from direct employee involvement in how employee influence is expressed and in the content of the decision**.** Employee representatives usually serve as advisory or informational channels of influence on a wide range of corporate-level decisions, including investment policy, technological change, and corporate-level strategy.

Direct employee voice is often categorized as being either consultative or substantive (Levine and Tyson, 1990; Marchington, 2006).[1] Consultative participation (also known as upward problem-solving) involves soliciting of workers' suggestions on issues important to their day-to-day activities and about which they have significant information not readily available to management. While workers' suggestions are solicited, workers do not decide how to solve problems and may not be involved in implementing the

suggestions that are accepted by management. In contrast, substantive participation involves the creation of formal, often permanent structures such as work teams to organize and facilitate a definite employee role in workplace decisions.

In practice, it is difficult to distinguish consultative from substantive topics associated with direct voice, beyond the formal work structures associated with the latter. We will focus on the 'influence' aspect of employee voice, which allows us to examine both direct (e.g. teams) and indirect (e.g. worker representation via unions and work councils) types of voice. This approach has advantages over assumptions that formal work teams always lead to substantive participation; as Klein et al. (2000) point out, while two plants, A and B, may both have teams that do collective problem-solving, teams in each plant may have very different levels of influence on actual decisions.

A review of the empirical literature on the relationship of types of voice to organizational performance shows mixed results and different patterns for direct and indirect voice. Doucouliagos (1995) and Levine and Tyson (1990) survey the extensive research on direct voice (participation) and find a positive (often small) effect on productivity, sometimes a zero or statistically insignificant effect, and almost never a negative effect. Employee direct voice is more likely to produce a substantial, long-lasting increase in productivity when it involves decisions affecting daily work activities and substantive (i.e. more influence) rather than consultative (i.e. merely participative) arrangements (Levine and Tyson, 1990).

Similarly, Cotton et al. (1988) assert that employee direct voice is most effective in increasing employee satisfaction and performance when employees have a substantial amount of influence in decision-making, and when the participation program is direct, permanent, focused on work-related issues, and of substantial duration. When employee influence is high, group cohesion and commitment to those decisions on which employees are able to provide input is enhanced. Furthermore, direct voice mechanisms that provide higher degrees of influence have a greater potential to enhance performance outcomes. Heller (1998) observed that 'high degrees of influence sharing are associated with a better quality and effectiveness of decisions and a significant reduction in the underutilization of people's experience and skills' (p. 1439).

The evidence on the impact of indirect voice (i.e. unions and/or works councils) on economic outcomes is more mixed. Addison and Belfield (2004) summarize convergent findings from US-based research that found union effects on productivity were small but positive on average (in contrast with the impact on profitability, which was consistently negative). British research, in contrast, found lower productivity in unionized plants in the 1980s and earlier (Fernie and Metcalf, 1995), an effect which diminished in subsequent years. Research on German works councils reports a range of responses, with a recent review concluding that the predominant pattern is an absence of negative works council effects on average rather than clear pro-productivity effects (Addison and Siebert, 2003).

We have emphasized theories of direct and indirect employee voice here, but we acknowledge that there are many theories that center on participatory social arrangements in organizations, including democratic and socialist political theory and psychological theories of human growth and development. All emphasize direct voice as the

most consequential in its combined effects on individuals and organizations, even where indirect voice may be a more effective way for employees to realize distributive gains (Dachler and Wiplert, 1978).

We will discuss these issues more specifically as we set up hypotheses about the relationship between team and representative voice on labor productivity in this context.

Team voice Teams are one of the most important mechanisms through which employees can exert direct influence, and 'team influence' is how we operationalize direct voice. As noted above, we are focused here on the collective aspects of employee experiences in teams as antecedents to voice behaviors. This is consistent with the group-level perspective on empowerment that centers on its enactment through team-based structures and practices, in contrast with an individual-level perspective that primarily emphasizes intrinsic motivation as an outcome from feeling empowered (Liden and Arad, 1996).

Prior research cautions against assuming that practices, policies, and work organization changes that boost job satisfaction and motivation will have a similar impact on individual and/or team performance. Wall et al. (1986), for example, find that while satisfaction increases in the presence of autonomous work groups, individual performance does not. This is similar to Kelly's argument, from a review of job design studies, rejecting 'the assumption that job satisfaction, motivation, and performance share the same set of determinants' (1992: 768) and instead recommending a view of these determinants as analytically distinct.

Another issue is whether voice activities at the team level are connected to performance only through their impact on individual motivation (see Liden and Tewksbury, 1995) or whether there is a separate group-level effect. Team empowerment (a concept closely related to direct team voice) has been found to lead to superior performance via the impact on individuals in a number of contexts. Kirkman et al. (2004) find that empowered virtual teams have superior process improvement and customer satisfaction. Examining architecture teams, Burpitt and Bigoness (1997) find that when leaders provide opportunities for higher levels of voice and involvement, innovation by individuals, aggregated to the team level, is greater.

These performance effects occur via a variety of mechanisms. Kirkman and Rosen (1999) argue that team empowerment leads members to have a more positive collective perspective on their tasks, leading to increased motivation and ultimately performance. In a multivariate analysis, Kirkman et al. (2004) find a positive relation between team empowerment and individual commitment to team and organization, as well as positive implications of empowerment for customer service. Seibert et al. (2004) make a related argument about team empowerment, emphasizing not only intrinsic motivation for individuals but also participative decision-making and social learning theory as group-level effects on performance.

In this literature, individual and team empowerment are conceptually differentiated. Chen and Kanfer (2006) argue that while individuals' perceptions of their personal empowerment may be closely related to the degree of team empowerment, there may nevertheless be important differences between the two. Subsequently, using data from

62 teams and 445 individuals in stores of a Fortune 500 company, Chen and colleagues (2006) found that team empowerment moderates the relationship between individual empowerment and management's assessment of performance. This literature supports the conceptual validity of team-level voice and its predictive power for performance outcomes, and hence our choice to focus on this concept.

Looking specifically at economic performance, there is extensive research on the relationship between employee involvement work practices such as teams and outcomes such as labor productivity (e.g. Arthur, 1994; Banker et al., 1996; Black and Lynch, 2004; Devaro, 2008; Ichniowski et al., 1997; Kato and Morishima, 2002; MacDuffie, 1995a, 1995b). This literature characterizes teams as a direct voice mechanism chosen to reduce the need for costly monitoring (by substituting peer control for supervisory control) and to increase employee work effort (via peer pressure and social learning, plus from opportunities to master multiple skills and rotate jobs), ultimately leading to greater efficiency/productivity.

Furthermore, employees organized into teams are encouraged to make suggestions and participate in identifying and solving workplace problems, some of which will involve productivity gains. Employees' participation in teams provides a mechanism for reducing resistance to change, increasing commitment, ultimately leading to improved performance (Klein et al., 2000). By participating in teams, team members suffer less from information asymmetry and develop more trust in management; employees in teams report stronger commitment and better alignment with organizational goals (Levine and Tyson, 1990). Where firms are engaged in process improvement activities, workers who bring their close-to-the-problem ideas to other members of their team for debate and discussion have a channel for directly influencing process changes (MacDuffie, 1997). When teams address problems not directly related to productivity, such as quality and safety, they can help meet worker preferences for improvements on these metrics, and in the process can build individual commitment to the team's activities more broadly (Hunter et al., 2002).

In summary, the combination of higher motivation and commitment among workers to contributing via the team mechanism, the fuller utilization of worker knowledge, skills and abilities, and the direct input to process improvement decisions can have a significant impact on economic performance outcomes such as labor productivity.

In the specific auto industry context, the use of teams has increased dramatically over the last 20 years, particularly outside of the United States (Holweg and Pil, 2004; MacDuffie, 1995a, 2003; Pil and MacDuffie, 1996). Team voice in the auto assembly plant setting can be regarded as a mix of consultative and substantive participation, since the range of what teams can influence or decide in assembly plants is constrained by the interdependence enforced by the assembly line. Also, the agenda for employee input is often limited to performance-related issues of productivity, quality, and safety and team leaders are often chosen by management. However, the link between team voice and an economic performance measure such as labor productivity can hold, even in assembly plants where the teams have relatively little autonomy as 'members can still experience team empowerment to the extent that they feel a collective sense of potency . . . and a sense that the team's work has impact on stakeholders' (Kirkman et al., 2004: 177).

Therefore, we hypothesize:

Hypothesis 1: A higher degree of team influence will lead to higher levels of labor productivity.

Representative voice Two forms of indirect voice (both collective) are described in the literature: union voice and non-union representative voice (Bryson, 2004). We confine our focus here to the union form of collective voice. Non-union representative forms of indirect voice – as opposed to direct forms of voice in non-union settings – are decidedly rare. In the WERS, a large-scale study of establishments in the UK, for example, only 3 percent of workplaces were found to have non-union representative voice, typically taking the form of an employee council that provides input to management decisions. Similarly, in our context, only three factories in our sample of 94 assembly plants (roughly 3%) are non-union, so we exclude them from this analysis. While all of the factories that we analyze are unionized, some also have additional and related mechanisms of worker representation, such as works councils. As discussed further below, our measure of representative voice includes unionization as well as these other mechanisms of collective representation.

Freeman and Medoff (1984) adapted Hirschman's (1970) exit-voice model to explain the link between union voice, higher productivity, and lower quit rates. Hirschman defined voice as any attempt to change rather than escape from an unsatisfactory economic relationship. In the employment context, voice is the mechanism whereby workers work within the system, using direct communication to bring about internal change that yields desired conditions, and exit is the mechanism whereby workers pursue their interests by quitting (exiting) less desirable jobs for more desirable jobs. Freeman and Medoff argued that for worker voice to be effective in influencing managerial behavior toward employees, it must be collective voice. Without collective voice through the agency of worker representation, employees lack the incentive to pursue public goods, such as enhanced working conditions and workplace policies that affect the well-being of all employees, for example, grievance and arbitration procedures, just cause for discipline and discharge, and seniority clauses (Batt et al., 2002).

Previous research suggests that the effect of union voice on productivity is ambiguous. Union presence may lower labor productivity via restrictive work practices or lower firm investments due to lower firm profitability. Likewise, union voice may be associated with adversarial industrial relations, preventing the efficient flow of information between workers and management and not fully capturing the heterogeneity of input which workers may provide (Bryson, 2004). Alternatively, labor productivity may be higher in the presence of a union if: unions play a monitoring role on behalf of the employer; unions negotiate a set of workplace characteristics that conform closely to workers' preferences and improve employees' morale, motivation, and cooperation; unions make managers less lethargic; and unions stop exploitation of labor (Metcalf, 2003). While Brown and Medoff's influential study (1978) found that unions increased employee productivity by approximately 22 percent, the results of subsequent studies have been mixed depending on data and empirical model specification (i.e. Lovell et al., 1988). Given this mix of positive and negative effects, many researchers argue that the net effect of unions on

productivity is a question that must be examined empirically in different contexts (Doucouliagos and Laroche, 2003; Hirsch, 2004).

We are particularly interested in worker representatives' involvement and voice in strategic and organizational-level issues. In prior literature focusing on the effect of worker representation on productivity, worker representation is often measured as the presence of a union/works council or its density and coverage (e.g. Addison and Belfield, 2004; Wood, 1996). This limits the ability to explore how different levels of representative voice influence organizational outcomes. While there are different types of worker representation (e.g. unions, work council, joint labor-management committees, etc.) and the degree of their independence from management varies, we will use representative voice as a comprehensive term to describe any institution which represents employees' collective voice.

To the extent that institutions representing employees are effective in what they do, they will certainly provide benefits to their employee members. Some argue that strong worker representation may lead to employee gains at the expense of organizational performance. However, if unions or worker representatives have strong influence on a wide range of strategic, technological, and work issues, they are more likely to provide valuable input than when their exchanges with management are limited to a narrow set of distributive topics (see Kochan et al., 1994). This broader range of influence is likely to encompass more issues that affect how work actually gets done and hence labor productivity.

In the auto industry context, intensive global competition means that achieving high levels of labor productivity is viewed by most unions, particularly in recent years, as an important basis for achieving greater employment security rather than as a zero-sum proposition that benefits management but not workers. Furthermore, corporate decisions about capital investments in a given factory are often contingent on union acceptance of productivity-improving initiatives (Hunter et al., 2002).

We therefore hypothesize:

Hypothesis 2: A higher degree of representative voice will lead to higher levels of labor productivity.

Relationship between team and representative voice

There are divided views on the relationship between direct (team) and indirect (representative) voice in terms of both process (e.g. how do they interact?) and outcomes (e.g. what are the effects on both worker interests and organizational performance?). From one perspective, direct and indirect participation are complementary: direct participation provides opportunities for employee voice in relation to specific work tasks, while indirect participation provides opportunities for engagement with organization-level issues such as investment policy, technology, and corporate-level strategy (Levine and Tyson, 1990; Machin and Wood, 2005). Conversely, from this perspective, direct and indirect voice are not substitutes, since team voice does not address organization-level issues, and representative voice typically does not address performance aspects of specific work tasks (although it may address other aspects, e.g. ergonomics, safety). Furthermore, when management displays an open stance to discussing a broad array of issues at the representative level, this may indicate to workers that a serious hearing will be given to their efforts to provide input at the team level.

A related perspective argues that the efficacy of employee voice (direct and indirect) depends on the way in which labor and management interact, rather than whether unions exist or not (Freeman and Medoff, 1984). The greatest contribution to organizational performance results from giving employees influence both at the day-to-day operational level and at the policy level. A significant economic benefit of team voice comes from employees' willingness to share their ideas with management. This willingness may be greater if direct and indirect forms of employee voice are both used extensively. Interaction between these different forms of voice can provide cross-fertilization of ideas to improve operations and can create networks through which workers can gain personal support (Marchington, 2006). Accordingly, Pyman et al. (2006) found that indirect and direct voice are not mutually exclusive, and the interaction and coexistence of multiple channels of voice contributes positively to organizational outcomes.

However, from another perspective, these two types of voice are substitutes for one another. One argument is that having both types of employee voice is unnecessary to achieve employee satisfaction and good performance (e.g. Fernie and Metcalf, 1995; Fiorito, 2001). Direct voice practices are often conceived and implemented as a means to reduce worker dissatisfaction. The conjunction of the growth in employee involvement and the decline in unionism reinforces the idea that the two may be substitutes (Gallie et al., 1998), either by design (i.e. by enhancing worker satisfaction, managers may seek to reduce the demand for unionism) or by effect (i.e. workers who are more satisfied may perceive less need for representation). Indeed, some authors find negative effects of representative voice on employee perceptions of managerial responsiveness – effects which are offset when direct voice is present (Bryson, 2004).

Employee direct voice practices can represent a significant challenge to the influence of worker representatives (Beale, 1994). Managers sometimes introduce direct voice practices (i.e. team briefings) to reduce worker representatives' influence and marginalize the union; some unions oppose those practices which would challenge the union's own channels of workplace communications (Beale, 1994; Frost, 2000). More generally, employee direct voice schemes can offer an alternative source of information and ideas of workplace experiences to that provided by the union (Gollan, 2006), and, in this case, indirect (representative) voice may negatively interact with direct (team) voice in terms of organizational performance.

Thus, while there are competing views regarding the relationship between team and representative voice, we take the complementary viewpoint and hypothesize:

Hypothesis 3: The interaction between team voice and representative voice will be positively related to labor productivity.

Methods

Sample and procedures

To examine the effects of team and representative voice on manufacturing performance, we draw upon data collected through the International Automotive Assembly Plant Study (MacDuffie and Pil, 1995). The data for this study were collected via surveys by the

authors in 1994 and 2000 (hereafter Time 1 and Time 2) from automotive factories around the world. The data we collected included the team and representative voice metrics featured here, as well as a number of other factors that might influence labor productivity.[2] The plants represent over half of the total assembly plant capacity worldwide. Over 90 percent of the plants in each round are unionized, and teams were present in the majority of factories in the time period under study.

The survey was divided into several topics, and the survey's cover letter advised a contact person to distribute each section to the appropriate manager. Our main contact distributed the different sections to the appropriate departmental manager or staff group, collected the completed sections, and returned them to us for data entry and analysis. While we don't know the exact number of respondents contributing to data collection, our interviews with the contact person at each plant systematically indicate that several people (area managers, HR manager, etc.) were involved in answering the survey.[3] The authors have visited most plants in the sample for data verification, and we have found very high concordance between survey data and actual practice (MacDuffie and Pil, 1995). In Time 1, 77 large-scale factories participated representing a 79 percent response rate, and in Time 2, 60 large-scale factories participated representing a 70 percent response rate. After excluding plants which did not answer the voice-related questions and three plants that were not unionized, we use 116 cases in this study, of which 22 are duplicated across the two time periods. The multivariate analyses include 106 cases owing to missing values for some control variables.

Dependent variable

Labor productivity Productivity, the key dependent variable in our analyses, is measured by the log of the labor hours required to build a vehicle. Building on a methodology originally developed by Krafcik (1988), this is calculated based on the number of employees at each facility and annual production output, adjusted for actual working time (e.g. regional variations in breaks and lunch hours), the level of vertical integration of the plant, and key product characteristics that directly influence labor efficiency (e.g. vehicle size, weld and sealer content, option penetration) (MacDuffie and Pil, 1995).

Independent variables

Team voice Team voice assesses teams' influence on day-to-day and work-related decision-making. Respondents were asked: 'To what extent do teams influence decisions in each of the following 10 areas?' (1 = not at all; 5 = to a very great extent): 1) The use of new technology on the job; 2) Who should do what job; 3) The way the work is done – revising methods; 4) Who should be brought into the team; 5) Who should be dismissed from the team; 6) Performance evaluations; 7) Settling grievances or complaints; 8) How fast the work should be done; 9) How much work should be done in a day; and 10) Selection of a team leader. We use the average response score of those 10 items (Cronbach's alpha = 0.89). All but 31 of the plants have teams. (Our definition of 'teams' in the survey, was 'designated groups of production workers that meet regularly, organize their schedules and training as a group, and often rotate jobs or otherwise back each

other up'.) Plants without teams anchor the no-influence side of the scale. The mean of the team voice variable is relatively low (2.15 on a five-point scale), reflecting this mix of team and non-team plants. In the analyses, we include a dummy variable for the presence of teams to separate the effects of team use from team voice.

Worker representatives' voice This variable captures the influence of worker representatives' participation in strategic and organizational level issues. All plants had some forms of worker representation, and we restricted the sample to unionized facilities. Respondents were asked to indicate the influence worker representatives were likely to have on the following eight items (1 = no influence; 5 = very significant influence): 1) New investment plans; 2) Design of new technology; 3) Evaluation and selection among various technology options; 4) Restructuring of jobs and duties as a result of new technology; 5) Planning and coordination of training for new technology; 6) Changes in work allocation; 7) Changes in what work is out-sourced to suppliers; and 8) Fundamental shifts in product mix. Worker representatives' influence was measured as the average of these eight items (Cronbach's alpha = 0.77). While in many instances these discussions were mandated by law or union agreement, we are focusing specifically on the degree of influence management feels that representatives have on these issues. The mean of this variable is relatively low (2.42 on the five-point scale), although the variance is substantial.

Control variables

A number of variables can be expected to correlate with our dependent variable, labor productivity (MacDuffie, 1995a; Pil and MacDuffie, 1996). See Table 1 for variable descriptions and Table 2 for correlations.

Car age It is expected that products designed more recently are easier to assemble than older products and require fewer labor hours per vehicle.

Plant scale Scale is expected to correlate negatively with labor productivity. We expect that larger-scale plants will have fewer labor hours per vehicle.

Total automation Higher levels of automation should reduce the amount of labor needed to build a vehicle. The average factory automated about 33 percent of the production process.

Parts complexity Part complexity is expected to correlate positively with labor hours per vehicle.

Use of buffers Lean factories are expected to require fewer labor hours per vehicle (MacDuffie, 1995a).

HRM policies High commitment HR practices are expected to positively correlate with labor productivity (negatively with labor hours per vehicle).

Location To assess the robustness of our findings (to the extent that our sample size allows), we utilize country dummies for the US, Canada, Japan, and Korea and regional dummies for Europe and 'all other countries' (the latter as the base category for comparison) to control for possible institutional and cultural differences in team and representative voice.

Choice of analytical method

Our data is an unbalanced two-time period sample. Because of the limited overlap across the two time periods, we estimate an OLS regression with robust standard errors, clustered by plant. There are 22 common plants across the two periods under study and we assume that the observations are clustered into common plants and correlated within plants over time (e.g. practices and policies of a specific General Motors assembly plant in 1994 would be correlated with those of that same plant in 2000) but would be independent across plants. A time dummy (set at 1 for 1994), controls for differences across time periods.

Results

Table 1 presents the means, standard deviations, and description of the variables used in regression analyses and Table 2 presents correlations among the variables. Although the correlation between team voice and representative voice is not significant, that masks the relationships that exist at different levels of each type of voice. The regression analysis results are presented in Table 3.

Equation 1 includes control variables, and Equation 2 includes two independent variables related to teams – the team dummy and the team voice index. Equation 3 examines representative voice on its own, while Equation 4 includes both team voice and representative voice. The interaction term between the two voice variables is added in Equation 5. As a final test of the robustness of our findings, we included location variables in Equation 6.

In Equation 1 (and in all six equations), higher scale of production and higher levels of automation are associated with more efficient production (fewer labor hours). Use of buffers (in all equations) and part complexity (in Equations 3, 4, 5 and 6) have positive signs, indicating that factories with more buffers and complexity require more hours to build a vehicle.

In Equation 2, neither the team dummy nor the team voice variable is significant. In Equation 3, representative voice is marginally significant and is associated with higher hours per vehicle. Furthermore, in Equation 4, when both voice variables are included, the team variables are not significant while representative voice is again marginally significant with a positive coefficient.

Once the interaction term is included (Equation 5), both team and representative voice variables are significant, with a negative sign: assembly plants with a more direct worker influence (team voice) and higher indirect worker influence (representative voice) require fewer labor hours per vehicle. However, the interaction term between team voice and representative voice in Equation 5 has a *positive* coefficient, that is, is linked to higher labor hours per vehicle, suggesting that these forms of voice do not have synergistic effects. The results for the model incorporating regional controls (Equation 6) are consistent with the model that does not include such controls (Equation 5).[4]

Table 1 Variable descriptions

Variable name	Mean	SD	Description
Dependent variable			
Productivity (LN Productivity)	23.17 (3.08)	8.83 (0.37)	LN of labor hours required to build a vehicle adjusted for level of vertical integration of the plant, product characteristics, and labor time differences across plants – *Higher values reflect lower efficiency*
Independent variable			
Team voice	2.15	0.88	The degree of teams' influence on a variety of work related-issues (The average of 10 items: 1 = not at all; 5 = to a very great extent)
Worker reps' voice	2.42	0.73	The degree of worker representative's influence on a variety of managerial issues. (The average of 8 items: 1 = not at all; 5 = to a very great extent)
Team dummy	0.73	0.44	1 if there are teams in the plant; otherwise, 0
Car age	3.30	2.14	The weighted average number of years since a major model change introduction for each of the products currently being built at each plant
Plant scale (LN plant scale)	921.22 (6.68)	464.76 (0.59)	LN of the average number of vehicles built during a standard, non-overtime day, adjusted for capacity utilization
Total automation	0.33	0.11	Overall automation stock, defined as a percentage of direct production steps that are automated
Parts complexity	0	2.74	Sum of the standardized z scores of the number of wire harnesses, engine/transmission combinations, and paint colors, indicating the extent of variety in parts used to assemble a plant's products
Use of buffers	0	0.82	Sum of the standardized z scores of two production practices that indicate the degree to which production operations are buffered against potential disruptions. – the space dedicated to final assembly repair – the average number of vehicles held in the work-in process buffer between the paint and assembly areas
HRM policies	0	0.50	Sum of the standardized z scores of five HR practices: – the hiring criteria used to select employees – the extent to which compensation system is contingent on performance – the extent to which status barriers between managers and workers are present – the level of training provided to newly hired workers – the level of training provided to experienced workers
Location dummy variables			US, Canada, Japan, Korea, Europe, and Other Countries ('Other Countries' dummy is used as the reference category)

In Table 4, we report interaction between team voice and representative voice by assessing the standard errors associated with coefficients for one variable at different levels of the

Table 2 Correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Productivity	22.48	8.83	1																	
2. LN productivity	2.147	0.86	.98**	1																
3. Team voice	2.15	0.88	.17	.15	1															
4. Worker reps' voice	2.42	0.73	.25**	.26**	–.08	1														
5. Team dummy	0.73	0.44	.16	.14	.75**	–.18	1													
6. Car age	3.30	2.14	.26**	.23**	–.03	.05	–.10	1												
7. LN plant scale	6.68	0.59	–.52**	–.49**	–.14	–.21*	–.08	–.01	1											
8. Total automation	0.33	0.11	–.63**	–.62**	–.07	–.05	–.07	–.34**	.47**	1										
9. Part complexity	0.00	2.74	.10	.08	.49**	–.25**	.52**	.04	.24**	.01	1									
10. Use of buffers	0.00	0.82	.20*	.19	.19*	.23**	.12	–.23**	–.17	.10	–.06	1								
11. HRM policies	0.00	0.50	.11	.13	.38**	.08	.43**	–.18*	–.20*	–.01	.17	.08	1							
12. Time 1 dummy	0.60	0.49	.29**	.33**	.05	.06	–.01	.50**	.05	–.37**	.12	–.28**	–.13	1						
13. US dummy	0.31	0.47	–.23*	–.21*	–.35**	.16	–.40**	–.11	.11	.26**	–.52**	.08	–.16	–.07	1					
14. Canada dummy	0.09	0.28	–.16	–.16	–.32**	.10	–.37**	–.03	.03	.11	–.32**	.05	–.21*	–.01	–.21*	1				
15. Europe dummy	0.27	0.44	.16	–.16	.11	–.03	.37**	–.04	.14	.01	.39**	.14	.22*	–.03	–.41**	–.19*	1			
16. Japan dummy	0.12	0.33	–.35**	–.39**	.33**	–.39**	.22*	.11	.15	.18*	.46**	–.23*	–.03	.08	–.25**	–.11	–.22*	1		
17. Korea dummy	0.08	0.27	.15	.18	.12	.06	.03	.05	.02	–.01	.21**	–.09	.12	.04	–.19*	–.09	–.18	–.11	1	
18. Other countries dummy	0.13	0.35	.44**	.46**	.18	.07	.13	.08	–.51**	–.62**	–.14	–.03	.05	.02	–.27**	–.12	–.24**	–.15	–.12	1

** Statistically significant at the 0.01 level; * at the 0.05 level.

Table 3 Team voice and worker representatives voice on LN labor hours per vehicle (unstandardized coefficients, robust standard errors in parentheses)

Variable	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5	Eq. 6
Team voice		–.043		–.045	–.309***	–.171*
		(.051)		(.047)	(.086)	(.076)
Worker reps' voice			.079+	.081+	–.158*	–.124+
			(.040)	(.041)	(.068)	(.068)
Team voice* Worker reps' voice					.105***	.068**
					(.029)	(.022)
Team dummy		.035		.060	.011	–.030
		(.088)		(.090)	(.078)	(.080)
Car age	.003	.003	.001	.002	.005	.009
	(.015)	(.015)	(.015)	(.015)	(.014)	(.014)
LN plant scale	–.183***	–.197***	–.171***	–.183***	–.193***	–.220***
	(.049)	(.048)	(.048)	(.046)	(.045)	(.043)
Total automation	–1.264***	–1.227***	–1.327***	–1.282***	–1.296***	–.870**
	(.267)	(.268)	(.268)	(.268)	(.255)	(.290)
Part complexity	.017	.022	.026+	.026+	.035*	.038*
	(.013)	(.015)	(.013)	(.014)	(.013)	(.017)
Use of buffers	.103*	.110*	.087*	.092*	.087*	.065+
	(.039)	(.042)	(.036)	(.040)	(.036)	(.034)
HRM policies	.036	.182	.017	.019	.029	–.017
	(.070)	(.062)	(.066)	(.062)	(.066)	(.059)
Time 1 dummy	.175**	.182**	.147*	.154*	.159**	.185***
	(.061)	(.062)	(.060)	(.062)	(.057)	(.055)
US dummy						–.050
						(.128)
Canada dummy						–.134
						(.140)
Europe dummy						.013
						(.117)
Japan dummy						–.401**
						(.129)
Korea dummy						.137
						(.114)
Adjusted *R*-squared	.5251	.5292	.5480	.5525	.5988	.7017
F for equation	28.64***	23.65***	23.64***	21.30***	19.76***	23.20***
F for R^2 change		(2)–(1)	(3)–(1)	(4)–(1)	(5)–(4)	(6)–(5)
		0.418	4.914*	1.939	10.848**	6.140*

N = 106.

*** Statistically significant at the 0.001 level; ** at the 0.01 level; * at the 0.05 level; + at the 0.10 level.

other variable (Hunter and Lafkas, 2003; Jaccard et al., 1990). The slope coefficients based on Equation 5 indicate that higher levels of team voice are associated with lower labor hours for levels of representative voice below the mean. Slope coefficients based on Equation 6 suggest that team voice improves labor productivity only at the lowest levels of representative voice. At higher levels of representative voice, that association is statistically insignificant. This will be discussed in more detail below.

Table 4 Slope of LN (labor hours per vehicle) on team voice at differing levels of worker representative voice[a]

Levels of worker representative voice	Estimated slope of labor productivity on team voice (standard error)	
	Based on Equation 5 in Table 3	Based on Equation 6 in Table 3
Minimum 1.220	–0.180** (0.032)	–0.088** (0.027)
Low (one SD below the mean) 1.690	–0.130* (0.056)	–0.057 (0.050)
Mean 2.418	–0.054 (0.121)	–0.007 (0.115)
High (one SD above the mean) 3.146	0.023 (0.222)	0.042 (0.094)
Maximum 5	0.218 (0.643)	0.167 (0.636)

** Statistically significant at the 0.01 level; *at the 0.05 level.

[a]As Jaccard et al. (1990) showed, the formula for each slope coefficient = β[(team voice) + β(team voice*worker representation voice)]X, where X takes on particular chosen values of worker representation voice. Here, X is set at the minimum, maximum, mean, and one standard deviation below ('low') and above ('high') the mean for representation voice. The standard error for each coefficient at each level = [var(ß team voice)+X^2var (ß worker rep voice)+2Xcov(ß team voice, ß worker rep voice)]^1/2.

Discussion

Implications

We conclude that Hypotheses 1 and 2 are supported based on Equations 5 and 6. We find that team voice improves labor productivity but only when the interaction effect with representative voice is taken into account. Involving the expertise of workers directly in the work process via teams may contribute to the plant's labor efficiency. We also find that worker representatives' voice shows a positive relationship with productivity when the interaction with direct voice is included.

Finally, we find no synergistic effect between employee involvement through teams and worker representation, and thus Hypothesis 3 is rejected. Team voice and representative voice interact negatively on labor productivity and the contribution of team voice to improving labor productivity decreases when plants have strong worker representation. However, having strong team voice is always good for labor productivity and having high levels of both team and representative voice yields better productivity than the combination of low team and low representative voice (see Figure 1 based on standardized coefficients from Equation 6).

A combination of low team and low representative voice yields the worst outcomes. The fact that both off-diagonal conditions (high team–low representative voice; and low team–high representative voice) shows better labor productivity (e.g. lower hours per vehicle) is not easily explained. However, the fact that high team voice is associated with better performance in the presence of low representative voice certainly suggests these two forms of voice do not complement each other.

Indeed, our results suggest that team and representative voice may be substitutes in this context. Where managers need to improve a plant's capability to achieve high

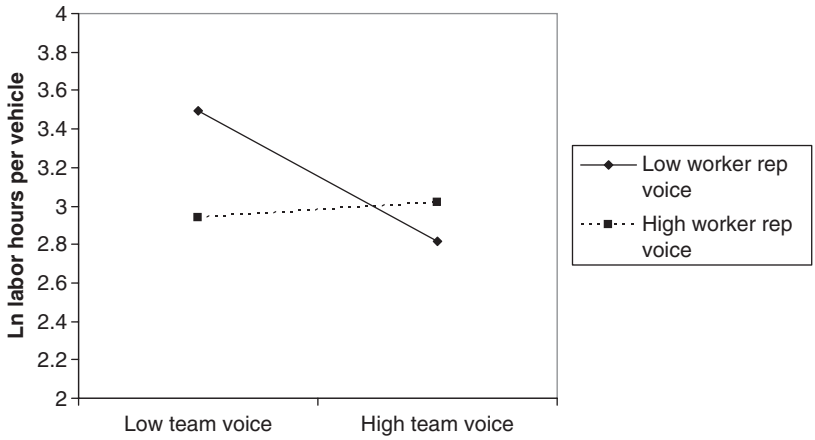

Figure 1 Interaction results (team voice*worker representatives' voice)
Dependent variable: LN Labor productivity (labor hours per vehicle)
All variables are standardized before calculating the interaction effects, coefficients based on Equation 6 in Table 3.

productivity, they seek to involve key employees in decision-making. Managers usually prefer to use direct participation in order to access workers' knowledge in such circumstances (Dundon et al., 2004). Since representative voice in the form of unions has been present in this context for a much longer time than work teams, we can infer that the extent to which direct or representative participation mechanisms are used may be affected by the relative strength of unions (or worker representatives) in each workplace. Where worker representatives' influence on decision-making is high, this could create barriers to the use of direct participation. Indeed, unions may see direct participation as harmful to their representative influence (Frost, 2000).

There are multiple dimensions for examining mechanisms for employee voice, including the values and assumptions of the designers and implementers of the participatory arrangements, the contextual and societal boundaries of the participatory arrangements, and the properties of the participatory systems (Dachler and Wilpert, 1978). While all three are significant, our focus has been on the structural allocation of influence to lower level workers – both directly, and via representative entities like unions and works councils. Nevertheless, it is possible (indeed, likely) that the relationship between team voice and representative voice – and hence the entire issue of whether these forms of voice are complements or substitutes – will differ based on the institutional context (Bryson, 2004; Machin and Wood, 2005; Marchington, 2006; Markey, 2001).

In this regard, the tradition of industrial democracy in Europe clearly influences managerial acceptance of representative influence (Heller, 1998). Under the German codetermination system, unions have found that employee participation, via both works councils (representative voice) and team voice can complement their role (Markey, 2001). In contrast, Japan is known for enterprise unions that predominantly support management's strategic decisions (low representative voice) but also for early adoption of direct voice mechanisms such as quality circles and shop-floor work teams (Koike, 1978).

Our data bear out these general assessments at the national level. For example, the Japanese plants in our sample generally have high scores for direct participation and low scores for worker representative influence. However, the multiple institutional elements that may influence the efficacy of voice were not assessed directly in this study. To assess the robustness of our findings to the influence of location and institutional context, we divided the sample by regions and ran regressions within each sub-sample. We did not find any significant changes in results. Furthermore, we checked for a Japan effect by re-running the analyses excluding Japanese plants. Again, the results do not change substantively. We discuss this issue below.

We note that our results do not fit comfortably with the assumptions made by many advocates of direct voice, nor with those of supporters of representative voice. Neither type of voice, on its own, consistently predicts better labor productivity. Even when the two forms of voice are combined, their relationship with labor efficiency is complex, given that the positive link of each to greater labor efficiency is somewhat offset by them being partial substitutes. Types of voice can interfere with, or neutralize, each other. In this context, that occurs more frequently than the mutual reinforcement some might expect. Nevertheless, the combination does ultimately have a positive impact on economic performance, consistent with the thrust of recent European policy-making, and in contrast to the 'direct-voice-only' trends in the US and UK.

Limitations

One limitation of this study is that survey questions about teams and worker representatives were answered by management, not by employees. It would have been ideal if we had been able to obtain employees' and worker representatives' perspectives regarding employee involvement so we could compare their assessment to that of management.

However, our voice measure does have several advantages over those used in much of the existing literature. Many prior studies measure employee involvement by the presence of teams or by the percentage of employees in teams. We focused on perceived team *influence* on a variety of work-related issues. Similarly, many studies measure employee involvement through worker representation by the presence of unions or union density. In contrast, we measure the degree of worker representatives' *influence* on multiple collective voice issues. Nevertheless, the real possibility does exist that managers' evaluations of employee involvement might differ from employees' evaluations. While we are confident that we are accurately capturing managerial perceptions, it is important for future research to explore the concordance between management and worker perceptions of influence and the associated implications for performance.

Another limitation of this study is that we cannot control for important differences in laws, policies, institutions, and cultures across the countries being studied because of our small sample size ($n = 116$). As we discussed above, there are a number of studies that suggest these may be very important. Our data provides some indication that these may also play a role in our sample. As can be seen from correlations, for example, workers in US and Canadian factories have less team influence, and representative influence is lower in Japan.[5] Inclusion of these location-related variables in the regression analysis does not affect the fundamental pattern of results, although the percentage of variance

explained does increase by a statistically significant amount. Further, the large and significant coefficient for Japan suggests there are other factors related to high labor productivity in that country that we are not capturing in these analyses.

Each country displays a complex pattern of employee involvement activities and a varied mix of direct and representative mechanisms and that pattern and mix may vary significantly over time, under different economic conditions and political regimes (Heller, 1998; IDE, 1981, 1993; Markey, 2001). In our study, the factories represent 22 different countries. Given our sample size, it is not feasible to include all country dummy variables. However, differences like those for Japan clearly indicate the value of additional exploration of country-level drivers of direct and employee representatives' influence. Furthermore, our outcome variable, efficiency, is subject to the effects of a number of economic variables, including demand, exchange rates, and macro-economic events (Heller, 1998). It is desirable for future studies of voice effects on performance to include macro-economic variables like these that often differ at the regional and national level.

While we recognize the importance of the industrial relations climate in the link between collective voice and performance, we did not have a good indicator of this at the establishment level. This is a limitation of our work, as prior research has found that the industrial relations climate is related to the success of the employee involvement practices within organizations (e.g. Cooke, 1992). With respect to labor efficiency, Katz et al. (1983) found that, at least for General Motors plants in the USA, a cooperative industrial relations climate was highly correlated with productivity.

Lastly, this research is cross-sectional in design, so caution must be exercised in the interpretation of the observed associations. Our overlapping sample between the two time periods under study is not sufficient to undertake causal statistical analyses. There is the possibility that the high labor productivity of some plants is driving managerial perceptions of the value of employee involvement. To understand actual causal relationships among the variables, a large-scale longitudinal sample would be valuable. Nevertheless, this study suggests the importance of exploring not just the existence (and level) of employee participation or worker representation, but also the impact of these different aspects of employee voice, separately and interacting, on organizational performance.

Conclusion

This article contributes to the growing literature on the multiple forms of employee voice in several ways. First, we draw data from a single industry at the establishment level, with a proximate economic performance outcome. This increases the validity of our hypothesized connections between employee voice and organizational performance. Second, in our measures of direct and representative voice, we measure the extent of the influence rather than simply assessing the presence of teams or unions. Third, we build on the European tradition of examining both direct and indirect voice and are able to address debates over whether team and representative voice are complements or substitutes. Fourth, our detailed exploration of these interaction effects – and our finding of no complementary effect and only a partial substitution effect – allows us to differentiate between different combinations of high and low incidence of these two types of employee voice with respect to labor productivity. Given that the poorest outcomes result from a

combination of low team and low representative voice, the general importance of boosting employee voice – in its various forms – is strongly reinforced.

Acknowledgements

The authors would like to thank Peter Cappelli, Martin Conyon, Katherine Klein, Thomas A Kochan, Robert B McKersie, Mari Sako, and Valery Yakubovich for helpful comments on earlier versions of this article. The authors also acknowledge the International Motor Vehicle Program (IMVP) for funding the longitudinal International Assembly Plant Study on which this article is based, as well as their individual research activities.

Notes

1 Employee grievances are also often considered a form of direct voice (Dundon et al., 2004; Marchington, 2006). These are outside the scope of this article.

2 MacDuffie (1995a) explored the determinants of labor productivity, using International Assembly Plant data from 1989, focusing on practices associated with lean production: Use of Buffers, Work Systems, and HR Policies. Here we use 1994 and 2000 data and include Use of Buffers and HR Policies indices for our examination of employee voice. We do not utilize the Work Systems index because of multicollinearity with the team voice measure under study. While the variables in the Work Systems Index captured whether or not various direct voice activities were present at a given plant, the team voice variable captures the *influence* of these activities, which is arguably more proximate to operational performance. This is subject to caveats about the team voice measure discussed below.

3 In using a single survey to assess our key measures, we follow common practice in human resources research. Much of the current research on work and HR practices and systems relies on single raters (e.g. Delery and Doty, 1996; Huselid, 1995; Osterman, 2000). To increase concordance between actual practice and survey response, we follow the recommendations of Hunter and Pil (1996), and center our questioning at the establishment level.

4 If we translate the log hours per vehicle into real hours, a 1 standard deviation (SD) increase in team voice leads to a 3.6 hour reduction in real hours per vehicle and a 1 SD increase in representative voice leads to a 2.2 hour reduction in real hours in Equation 6.

5 It is worth noting that the correlations between 'representative' voice and most of the regional dummy variables are not statistically significant. Only the Japan dummy variable has a significant correlation with representative voice, and it is negative (-0.39). The negative coefficient is consistent with the view that the enterprise unions of Japanese companies have a more limited influence than the industrial unions in other countries.

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