

# **Beyond Incentive Pay: Insiders’ Estimates of the Value of Complementary Human Resource Management Practices**

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**H**ow can managers elicit the best performance from their workforce? Economists have written extensively on this question, often focusing on various types of incentive pay contracts aimed at eliciting greater effort from employees. This theoretical research identifies features of employment relationships that limit the effectiveness of simple piece-rate incentive pay plans and that force managers to consider other forms of incentive pay. In addition, managers introduce other human resource management practices—concerning employee training, hiring criteria, teamwork, job design and employee hierarchies—that are aimed at eliciting optimal performance (see reviews in Gibbons, 1998; Gibbons and Waldman, 1999; Lazear, 1999; Murphy, 1999; and Prendergast, 1999). Still, without empirical evidence on businesses’ human resource practices, it will remain an open question whether the theories proposed in “personnel economics [are] real or merely a series of clever models proposed by abstract thinkers who have little contact with reality” (Lazear, 1999).

In this study, we describe a new research approach—an approach we label “insider econometrics”—that is aimed at producing empirical estimates of the value of alternative human resource management practices. This “insider” approach goes deep inside businesses to understand how human resource management practices affect specific production processes. Using this insider approach, the analyst is

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guided by several basic principles: identify a narrow production process that can be modeled empirically; visit a significant sample of work sites that have that production process; conduct field research to understand the process thoroughly; interview a range of people to develop alternative views of the process and the human resource management practices; and finally gather accurate panel data on production, technology and organizational practices from the broadest possible sample of worksites using this process. In contrast both to survey research that collects very general heterogeneous data and thus estimates more questionable production functions and to case study research that does not provide econometric analysis, research based on these steps make it possible to develop econometric estimates of the impact of organizational practices on performance. Moreover, discussions with industry insiders help interpret results concerning the performance effects of the practices and also offer insights about any limitations on the adoption of those practices. The obvious drawback of insider econometrics is that in studying a narrow process, one is less able to assess the generalizability of the results, but that drawback is weighed against the greater confidence one has in the accuracy of the econometric results.

Studies on the adoption and performance effects of new human resource management practices are important both to economists seeking greater insight into the function and structure of firms and to managers seeking better managerial practices for their organizations. As described below, U.S. businesses in the last 20 years have dramatically increased their use of “innovative” human resource management practices, where these practices include pay-for-performance plans like gain-sharing or profit-sharing, problem-solving teams, broadly defined jobs, cross-training for multiple jobs, employment security policies and labor-management communication procedures. Yet in our own visits covering hundreds of business establishments, we have found that managers continue to debate the value of these new human resource management practices. During one visit, one manager told us with confidence: “New approaches to human resources are going to be absolutely essential for our industry to improve its competitiveness.” At a nearly identical facility, another manager told us with equal certainty: “We’ve tried teams and information sharing and all that participation stuff and it was a dismal failure.” Clearly, choosing the best human resource management practices for managing a firm’s workforce remains a puzzling problem for managers as well as economists.

In this study, we review what has been learned about the value and use of innovative human resource management practices, including incentive pay plans, but also other practices that may complement these plans. First, we selectively review the theoretical literature in “personnel economics” and “economics of the organization” with an eye toward explaining why firms should consider adopting multiple innovative human resources management practices to get the best results. Second, we describe the “insider econometrics” methodology. Third, we review the emerging body of empirical research that utilizes this insider econometrics approach.

## Innovative Human Resource Management Practices: A New Organizational Technology

A useful starting point is to define the objectives of “innovative” human resource management practices and to contrast these with more “traditional” practices. Innovative practices, and their common objectives, include the following. Problem-solving teams are aimed at involving production workers or other non-managerial workers in solving production problems. Rotation of workers across jobs is used to increase worker flexibility and increase teamwork. Careful screening and selection of workers is required to identify those who have both high-level job- and task-related skills and also “team skills” to work together to solve problems. Job security is used to assure workers that improvements in production performance will not result in the direct loss of jobs. Information sharing is important to provide the information and motivation for greater involvement and decision making. Training is needed to do problem solving, to increase knowledge for better decision making and to introduce workers to the skills needed for more job tasks. Finally, incentive pay, in a wide variety of forms, is introduced to provide the incentive for greater employee effort and employee involvement in decision making.

We refer to these human resource management practices as “innovative,” given evidence from several recent surveys that show a significant increase in their use among U.S. businesses over the last 20 years. Prior to that time, more “traditional” human resource management practices—typically including hourly or salaried pay with little connection of pay for performance outcomes, assignment of workers to narrowly defined jobs with no job rotation, no work teams, hiring practices with limited screening for nonmanagerial or professional jobs, little formal training, limited sharing of operating data with employees and layoffs of employees when product demand declines—were much more common among U.S. businesses.

In many ways, U.S. businesses that were considering these innovative practices during the 1980s and 1990s were deciding whether they were going to adopt a “new organizational technology.” Cole (2000) provides a rich description of how large Japanese manufacturers began employing these innovations before the 1980s. When U.S. companies began searching for organizational practices that would help them match the quality performance of large Japanese manufacturers, some U.S. companies began to borrow methods of human resource management from Japanese manufacturers.<sup>1</sup>

Surveys of firms indicate that since 1980, U.S. businesses have increasingly abandoned traditional human resource management practices and increasingly

<sup>1</sup> These work practices were not transferred any earlier from Japan to the U.S. because they first emerged in Japan in the 1960s and were not widespread among large Japanese manufacturers until the late 1960s and 1970s. As part of our steel industry research, we conducted interviews with senior managers and union officials at six Japanese mills and three companies. Continuous improvement problem-solving teams had their origins in the Zero Defect initiative introduced in 1960 at Nippon Steel’s Yawata Works, which later evolved into today’s *Jishu Kanri* teams. These teams were widespread in Japan’s steel industry by the 1970s.

replaced them with multiple innovative practices. Lawler, Mohrman and Ledford (1995) survey large U.S. corporations and find that the use of employee participation teams nearly doubled among these large firms, from 37 to 65 percent, between 1987 and 1993. Osterman (1994, 2000) reports large increases in the use of work teams, job rotation and other innovative human resource management practices since the early 1980s based on his surveys of 806 private sector nonagricultural establishments in 1992 and 683 establishments in 1997.<sup>2</sup> Rapid growth in the use of innovative human resource management practices since the early 1980s is also documented in Ichniowski, Delaney and Lewin (1989), Black and Lynch (1996, 2000), Cappelli and Neumark (2001) and Gittleman, Horrigan and Joyce (1998).

Of particular interest to this study, these recent surveys of human resource management practices also show that early adopters have sustained their use of the practices and that U.S. businesses continued to adopt more innovative human resource management practices during the 1990s. As a result, most U.S. businesses now have multiple human resource management innovations. Osterman (2000) reports that by 1997, 85 percent of establishments had adopted at least one innovative human resource management practice, up from 65 percent in 1992. The percentage of establishments with more than one innovative human resource management practice increased from 38 to 71 percent over this same five-year period.

Thus, these surveys suggest that as the new organizational technology became increasingly known, firms adopted these practices. This analogy between an organizational technology shock and a scientific technology shock is important. It suggests that any estimated differences in performance between adopters and nonadopters could be real effects due to the adoption of these new practices. While businesses could have enjoyed returns to these practices earlier, they were not aware of their value.

## **Theories on the Value of Multiple Human Resource Management Practices**

U.S. businesses have increasingly adopted multiple human resource management innovations since the 1980s. What reasons might these businesses have for adopting multiple practices? Two or more human resource management practices are complements when “using one more intensely increases the marginal benefit of using others more intensely” (Holmstrom and Milgrom, 1994, p. 973). Numerous theoretical studies suggest three main reasons why certain human resource man-

<sup>2</sup> Osterman (1994, 2000) surveys establishments with more than 50 employees. To obtain accurate data on human resource practices, Osterman asked that the survey respondent be in the operations side of the business. He asked respondents to report on work practices that cover “core employees”—the largest group of nonsupervisory, nonmanagerial workers at the establishment who are directly involved in making the product or providing the service. Adoption rates in Osterman’s establishment-level survey will be lower than those reported in the Lawler, Mohrman and Ledford (1995) firm-level survey, because the latter survey asks respondents if they use the practice anywhere in their firms.

agement practices would be complementary in this sense. We briefly review the theoretical literature that provides three primary reasons for the adoption of multiple practices.

### **Complementary Practices to Reduce Problems under Certain Incentive Pay Plans**

When firms cannot accurately measure the contribution of individual workers and thus cannot use piece-rate pay, the firms will consider a range of other incentive pay plans. Piece-rate pay is little utilized—principally used by machinists and sales workers (MacLeod and Parent, 1999)—thus, alternatives are required. However, second-best plans often have their own inherent drawbacks that in turn can be lessened by the use of other practices.

Incentive pay based on group output is one example of a common alternative to piece-rate pay based on individual output. These *group-based incentive pay plans* can take several forms. In some manufacturing plants, output from machines is easy to measure, even though the contributions from each worker operating the machine are not. Firm-wide profit sharing is another form of group-based incentive pay. While these group-based incentives can be undermined by free riders, several studies argue that free-rider problems can be mitigated if group incentive pay is linked with additional work practice innovations. Kandel and Lazear (1992) argue that orientation and indoctrination about workplace norms when employees are hired improves the effectiveness of group-based incentives by creating a work environment where peer pressure enforces the group-based incentive. Kandel and Lazear also demonstrate that high-performing workers will not self-select into this kind of work environment, so careful screening of job applicants may also be beneficial. After the initial selection and orientation of workers, practices like quality circles and work teams may be just as important for their cultural effects on team spirit and for the opportunities they create for workers and managers to monitor each other as they are for the specific work tasks that take place in teams. Similarly, a managerial “culture” that emphasizes the importance of paying attention to people or offering fair rewards can result in positive peer pressure to perform and can then make group incentives effective (Kreps, 1990). More generally, any work practice that establishes a “high-effort norm” and an expectation among employees that everyone will work up to that norm can overcome free-rider problems (MacLeod, 1987, 1988).

Another way to design incentive pay when individual output cannot be easily measured is to base pay on the relative rankings of workers to form a *relative pay plan*. However, these plans have several drawbacks. First, they can discourage cooperation among workers and can even lead employees to sabotage the output of their peer competitors. To lessen these problems, firms may select employees with cooperative personalities, or they could design jobs to avoid grouping aggressive employees together (Lazear and Rosen, 1981; Lazear, 1989). Thus, firms can make relative pay plans more effective by combining these plans with job design and screening practices. Second, because the plans are often grounded in implicit or “relational” contracts, there is no explicit method of enforcing the contract (Baker, Gibbons and Murphy, 2002). Thus, other practices that might increase the value of

the employment relationship, such as objective bonus pay or training in firm-specific capital can complement these subjective pay plans (Baker, Gibbons and Murphy, 1994, 2002).

### **Eliciting Worker Ideas**

There has been an increasing emphasis on moving decision making from managers to lower-level workers with the objective of eliciting valuable ideas from these workers. However, it is generally the case that multiple human resource management practices must be adopted to support decentralized decision making. In particular, for firms to elicit valuable ideas, employees must have the opportunity, the incentive and the skills to generate these ideas. Different human resource management practices can help address these three dimensions.

Often, decentralized decision making involves employee participation in group-based problem-solving teams, so team-based job design is an important practice that affords workers an opportunity to develop ways to improve operations (Boning, Ichniowski and Shaw, 2001). Numerous researchers consider the best way to design incentives to motivate workers to participate in decentralized decision making (Jensen and Meckling, 1992; Baker, 1992). Since teams are likely to be important, the reward for such participation in teams is likely to be some form of group-based pay (Holmstrom and Milgrom, 1991). Furthermore, long-term interactions among employees that often develop in team-based work environments can enhance the effectiveness of group-based pay. These long-term relationships among workers can also lead firms to adopt other practices that permit peers to evaluate and monitor co-workers' performance (Che and Yoo, 2001, p. 526). Finally, if workers enjoy having an input in their choice of tasks or in solving problems, then higher levels of output can be achieved with lower-powered incentives (Zabojnik, 2002).

Regardless of the specific form of the incentive pay plan aimed at fostering problem solving, some additional human resource management practices may be needed to address workers' concerns about whether the incentives will in fact be paid. For example, workers' ideas for improving productivity may result in the elimination of jobs, so an employment security commitment may be needed before employees will offer these ideas (Aoki, 1988). A commitment to long-term employment security in turn implies that flexibility in job assignments is more valuable, since firms that have promised to avoid layoffs will need to reassign workers to different jobs. Flexibility in job assignments in turn requires training in more skills and jobs. Carmichael and MacLeod (1993) show how training workers in multiple skills will also make an employment security pledge more credible.

Training policies are also important for giving workers the necessary skills to develop valuable ideas. Decentralized decision-making requires interaction among employees, so this training may focus on "people" skills (Autor, Levy and Murnane, forthcoming). It can also emphasize firm-specific knowledge since employees are becoming expert in the details of running their own operations (Morita, 2001).

Clearly, creating a work environment in which employees participate in continuous improvement activities is not a simple managerial problem. A web of

complementary human resource management practices is needed to give employees the opportunity, the incentive and the skills to produce valuable ideas (Milgrom and Roberts, 1990, 1995).<sup>3</sup>

### **Multiple Human Resource Management Practices in Multitasking Models**

Theoretical studies of employees who are responsible for multiple tasks offer another reason for complementarities among human resource management practices (Holmstrom and Milgrom, 1991, 1994). Many employees work on a range of tasks and produce more than one type of output. Engineers may work on long-term research and development projects to develop better production methods and may work on short-term problem solving to maintain existing production equipment. College faculty conduct research and teach classes.

In manufacturing, production employees who are asked to generate valuable ideas to improve operations are still responsible for operating machinery and fixing breakdowns. If firms want employees to be diligent on the production line (one task) and to generate ideas for long-term improvements in production equipment (a second task), the firm will need to adopt and balance multiple human resource management policies that address incentive issues for the different tasks. For example, it may be optimal to design combined pay plans so that objective pay plans applied to simple tasks are combined with subjective pay plans applied to difficult-to-measure tasks. Thus, Holmstrom and Milgrom (1994, p. 990) conclude their multitasking model with the observation that “the key according to our theory is to evaluate [employment practices and incentive devices] not in isolation, but as part of a coherent incentive system.”

### **Estimating the Effectiveness of Innovative Human Resource Management Practices Using Insider Econometrics**

The rapid rise in the use of innovative human resource management practices over the last 20 years raises three interrelated questions that we address in this section. First, are businesses increasing their use of innovative practices because these practices raise productivity or overall performance? Second, not all businesses adopt innovative practices—so who should adopt these practices, and why? Third, if the new practices improve performance, is it because employees change the way they work to achieve better performance?

The data needed to address these questions are not readily available, since businesses do not share sensitive information on their performance and methods of management. Furthermore, work practices vary not only across firms in the same

<sup>3</sup> See Holmstrom (1982) and MacLeod (1988) for further analyses of teams. These examples pertain more to team production than to the kinds of continuous improvement and problem-solving practices that we focus on in this study. Aoki's (1988) analysis of Japanese manufacturing firms considers continuous improvement activities of worker teams. For more on the assignment of responsibility within firms, see Prendergast (1995), Rosen (1982) and Geanakoplos and Milgrom (1991).

industry, but also across establishments within firms and even across work groups at a given worksite. Even if analysts can obtain access to data on human resource management practices at this disaggregated level, it may still be unclear how to measure performance at this level. Finally, empirical research should be able to screen out factors that can co-vary with performance and human resource management practices and to develop an understanding of why some businesses have these practices while others do not.

In this section, we describe a methodology—“insider econometrics”—that we pursued in a series of recent studies in the steel industry to investigate the relationship between organizational practices and economic performance. This methodology goes deep inside firms and analyzes production processes well below the level of the firm. This applied “insider econometrics” is based on two broad principles. First, it uses extensive fieldwork to generate a detailed understanding of a specific production process, its technology and the nature of work involved. This understanding of the production process in turn provides invaluable insight into what data to collect to model that process. In some ways, the method borrows from a rich tradition in labor research that stresses fieldwork and the collection of primary data. But insider econometrics does not end with descriptive case studies, nor with qualitative reports from the field research. Instead, the second feature of this insider research is that it is designed to produce convincing econometric estimates of the effects of human resource management practices on performance. Decisions about the worksites visited and data collected at those sites are guided by the principles of rigorous hypothesis testing. Because insider modeling focuses on a specific production process, the econometric tests can be more persuasive because they are based on closer “apples-to-apples” comparisons. These dual principles generate systematic qualitative data that allow us to tell a rich story and systematic quantitative data that allow us to conduct exacting econometric tests beyond what is possible in ordinary case studies.

Insider-econometric analysis, however, does not refer to all econometric research conducted with data from companies. As the illustrations in the next section demonstrate, insider-econometric analysis is ultimately interested in estimating the effects of “organization-level” practices. To estimate effects of organizational “treatment” variables, samples must consist of organizational observations with and without these policies. Insider-econometric analysis therefore does not encompass many other kinds of econometric case studies of personnel records from a single establishment, such as those that describe employment patterns within a given organization (Lazear, 1992; Baker, Gibbs and Holmstrom, 1994). For some businesses, the “organization-level” production process is carried out by individual workers, so data on workers can be used to estimate the effects of organizational policies. Examples here include Lazear’s (2000) study of the productivity effects of piece-rate pay on the productivity of workers who install windshields, and other examples are given below. The main point is that insider-econometric studies are ones that estimate the effects of different organizational policies and practices on



performance, where performance can be measured for individuals or small units within the firm.<sup>4</sup>

### **Insider-Econometric Studies of Steel Industry Productivity**

Our own insider-econometric analysis of the productivity effects of human resource management practices in the steel industry can be summarized in five steps. First, for each study we identify one particular production process to analyze. This allows us to model a specific production technology, measure its output and technology thoroughly and accurately, and collect data at a level where human resource management practices apply to all the workers involved. Second, we include all such production lines in our analysis, thereby avoiding sample selection problems that arise when using partial samples. Third, we conduct field research at every production line and interview experienced workers and production experts to understand the production process and to determine the best data for measuring technology and productivity. Fourth, we interview multiple respondents at each line, including production supervisors, human resource management managers, line workers and union officials, to develop an accurate and comprehensive description of the actual human resource management practices at the lines. Fifth, we collect panel data on the productivity, technology and human resource management practices for these production line samples. Once we have a detailed understanding of a specific production process, firsthand knowledge of how employees affect performance and accurate measures of the variables that affect production, we are then at the stage where insider-econometric models can be estimated.

We followed this methodology in one study of finishing lines in integrated steel mills, which are mills that use basic oxygen blast furnaces (Ichniowski, Shaw and Prenzushi, 1997) and in a second study of rolling lines in steel minimills, which are mills that use electric arc furnaces (Boning, Ichniowski and Shaw, 2001). The first study uses panel data from 36 finishing lines that coat and treat very large coils of flat-rolled steel. The second study uses panel data from 34 minimill production lines that reheat very large steel beams and flatten and shape the steel into thinner rods or bars for use in construction or manufacturing applications. Both studies include almost all of the production lines of these types in the United States and develop large panels with well over 2,000 monthly observations in each study's sample.

### **Has Increased Use of New Human Resource Management Practices Improved Business Performance in the Steel Industry?**

In our study of integrated steel finishing lines, we conclude that *systems* of innovative human resource management practices are more effective in raising productivity than are the more traditional human resource management practices (Ichniowski, Shaw and Prenzushi, 1997). After examining 26 different human

<sup>4</sup> While we focus on human resource management practices, the organizational changes involved in adopting information technologies have produced some insider econometrics research, such as that by Hubbard (2000), Baker and Hubbard (forthcoming), and Athey and Stern (2002).

resource management practices, we identify four dominant systems of human resource management practices in these 36 finishing lines. At one extreme is the “high-involvement” human resource management system that incorporates innovative practices across all seven areas of human resource management that we consider—extensive employee screening, elaborate pay-for-performance plans, work teams, employment security guarantees, extensive labor-management communications, broad job definitions and ongoing training in skills and problem solving. At the other extreme is the “traditional” system with no innovative human resource management practices in any of these seven areas. The two intermediate systems are a “communications” system that goes beyond the traditional system by adding communication and information sharing and some team use and the “high-teamwork” system that goes beyond communications by adding extensive participation in problem-solving teams and formal training programs.

Given these measures of the lines’ human resource management environments, regression results for finishing lines show that, relative to the traditional human resource management system, productivity is 6.7 percent higher under the innovative human resource management system, 3.2 percent higher under the “high-teamwork” system and 1.4 percent higher under the “communications” system.<sup>5</sup> Lines that adopt a full bundle of innovative work practices therefore achieve the highest levels of productivity, and the traditional system produces the lowest performance. The same hierarchy of performance is also observed when examining quality of output.

We also estimate the productivity effects of changes in individual human resource management practices, and in no case did an individual human resource management innovation, such as problem-solving teams, have a measurable effect on productivity by itself. These patterns suggest that important complementarities exist among innovative human resource management practices. As a bundle, the innovative human resource management practices work, but are ineffective when individual practices are instituted. Complementarities among innovative work practices help explain the fact that U.S. businesses have increasingly adopted multiple human resource management innovations.<sup>6</sup>

The estimated 6.7 percent productivity difference between a line with the most innovative human resource management system and a line with the most traditional human resource management system is economically important. It translates into a difference in profitability of about \$2.24 million annually per finishing line. While precise figures on the operating profits of individual finishing lines were not

<sup>5</sup> Estimates of these productivity effects are virtually identical for models using the full panel data set and for models that allow for line-specific fixed effects, though fixed effects models do not permit estimates of the performance effects of the full innovative system, since traditional human resource management lines only switched into the communication or high-teamwork system and not all the way to the innovative system during the sample period.

<sup>6</sup> See Athey and Stern (1998) for a discussion of the difficulties of testing for complementarities.

available, this increase in annual operating profits corresponds to a large percentage increase in the annual profits of a finishing line.<sup>7</sup>

In our study of rolling lines in minimills (Boning, Ichniowski and Shaw, 2001), the central finding is that innovative human resource management practices improve productivity, but the effects of these practices are larger in some lines than others. In the minimill study, we focus on two key innovative practices: group-based incentive pay and problem-solving teams. Incentive pay is widespread in the sample with 91 percent of the lines having group incentive pay by the end of the sample period. Teams are less common, increasing from 12 percent of the lines in the late 1980s and increasing to 42 percent of the sample by the late 1990s. Teams may be complements with incentive pay since they only exist in lines with incentives. Teams may also be complements with other innovative practices, since the use of teams always implies the use of other innovative human resource management practices, though the specific innovative practices that are combined with teams varies from line to line.

Productivity regressions for minimill lines show that, on average, incentive pay raises output and the use of team-based work systems combined with incentive pay raises output even further. The average productivity effect due to teams and incentive pay for an average production line translates into an additional 3000 tons of steel annually worth approximately \$1.4 million. However, unlike the study of finishing lines in integrated mills, we find that the productivity effect of incentives plus teams is significantly larger in some lines than in others—specifically those in lines with more complicated production processes making more complex steel products. We return to this pattern in the next section that considers why some workplaces adopt innovative practices more readily than others.

### **Why Aren't New Human Resource Management Even More Common in the Steel Industry?**

If new human resource management practices promote better performance, why are these practices not adopted more universally among the population of these production lines? In the sample of finishing lines, 36 percent of the observations come from lines that kept the lowest-performing “traditional” human resource management system for the entire sample period. In the minimill sample, 58 percent of the observations did not yet have teams by the end of the sample period. Two main classes of explanations can be offered. First, workplace-specific factors, even for workplaces in the same industry, may mean nonadopters would not experience the gains in productivity that adopters have. Second, transition costs associated with switching from traditional to innovative human resource management practices may limit the diffusion of these practices. How do these two factors

<sup>7</sup> We expect this to be a conservative estimate of the profit impact. The calculation accounts for the direct costs of implementing the new work practices but ignores any increased revenue from higher quality steel finishing under the innovative human resource management system. See details in Ichniowski, Shaw and Premeaux (1997, pp. 303–304).

vary across the highly comparable work sites in our studies of the steel finishing industry?<sup>8</sup>

The minimill study jointly models productivity gains and human resource management adoption. It concludes that the lines with more complex production processes that make more complex steel shapes can increase productivity more from innovative human resource management practices and so are more likely to adopt them. Econometric results and the plant visit information both show that more complex production lines simply have greater potential productivity gains from team-based problem solving. Without the field research so integral to this methodology, one might have assumed that no such inter-line variation existed in such a homogeneous sample. Interviews pointed out that an important reason underlying this empirical pattern is that worker ideas generated from problem-solving efforts and workers' tacit knowledge of the production process were not as important in making less exacting steel products with less complicated rolling equipment.

The argument that differing degrees of complexity across work sites affects adoption rates of innovative practices does not apply in the integrated steel study. There, finishing lines are so homogeneous that the expected productivity gains from adopting systems of innovative human resource management practices appear to be very similar across the lines. So why then is the extensive system of innovative human resource management practices that promotes the highest levels of productivity found only in a minority of such lines? In this case, transition costs incurred when switching from one set of human resource management practices to another appear to be a more compelling answer.

In particular, traditional human resource management practices are concentrated among lines in "brownfield" work sites—old mills that have remained in continuous operations. Innovative human resource management practices are much more common among old lines that have been closed but later reopened by new owners, called "reconstituted" mills, and are almost universal in brand new lines, called "greenfield" sites. This pattern of innovative human resource management practices in greenfield and reconstituted sites, but traditional work systems in brownfield sites, appears to exist in other industries, as well (Kochan, Katz and McKersie, 1986). It suggests that transition costs involved in switching from traditional to innovative work practices—costs that only brownfield sites confront—are an important barrier to more widespread adoption of innovative work practices. We find evidence that lines that are less likely to adopt new practices are those with older production workers or with managers who have longer tenure at their mills, suggesting either that older workers or managers do not have the skills needed for the new human resources management environment or that they perceive that they will not benefit from their investments in new skills (Ichniowski and Shaw, 1995).

<sup>8</sup> A third possibility is that adoption of new human resource management practices is limited by the direct costs of implementing and maintaining these new human resource management practices. Our estimates above indicate that the productivity benefits of innovative human resource management far outweigh the direct costs of the practices in steel mills.

Just as it is costly to integrate new scientific technology into old production lines, it is costly to integrate new organizational technology into an old line. We gained further insights into the specific sources of these transition costs in our investigations of a third research question.

### **Is Work Done Differently Under Innovative and Traditional Human Resource Management Systems?**

If innovative human resource management practices are indeed responsible for improved performance of otherwise comparable businesses, then it stands to reason that workers are doing something different under innovative practices to cause the improvement. In Gant, Ichniowski and Shaw (2000, 2002), we present evidence on differences in the way employees do their jobs under innovative and traditional human resource management systems. These differences in the nature of work activity provide insights into how innovative work practices improve performance and why it is difficult for brownfield sites to switch from traditional to innovative human resource management systems. The central observation emerging from this research is that workers in the high-performing lines with systems of innovative human resource management practices are not simply working harder, they are working smarter. Workers in these lines engage in significant amounts of problem-solving activity that improves line performance.

While the effects of a worker's own human capital on productivity are a central topic in labor economics, this study measures differences in the "connective capital" of the workers. We define connective capital as a worker's access to the knowledge and skills of co-workers and model it as a key ingredient in effective problem solving. To measure differences in workers' connective capital under innovative human resource systems and traditional systems, we returned to the finishing lines at seven integrated steel mills and collected data on employees' own human capital and on their interactions with co-workers. We gave employees a list of the names of all the people in the person's work area (managers and staff as well as production employees) and asked them to indicate which employees they interacted with on a daily, weekly or monthly basis.

These data on worker interactions in the steel finishing lines document starkly different patterns of work relationships for lines with innovative human resource management systems and lines with more traditional systems. In finishing lines with innovative human resource management systems, workers interact with a majority of other line workers, both within shifts and across shifts. In lines with more traditional human resource management practices, workers interact with a much smaller number of their peers or managers.

Differences in connective capital between traditional and innovative lines can be traced in part to team problem-solving efforts in innovative lines, and this helps account for the superior performance of these lines. These differences in connective capital are also a likely reason for the limited adoption of new human resource management systems among brownfield work sites. Workplaces at brownfield sites with traditional human resource management practices would need to forge entirely new sets of relations among workers in switching to innovative work systems.

The higher levels of interaction and problem solving among workers under innovative work systems are also predicated upon broader job definitions with workers responsible for more tasks. The development of a brand new set of work relationships and the costs of training workers for more broadly defined jobs under innovative human resource management systems must pose a large transition cost for lines considering a switch from traditional work practices.

## **Further Evidence on Human Resource Management Practices and Economic Performance**

What evidence exists on whether the findings from our studies of the steel finishing sector apply in other industries? In this section, we review a growing body of research concerning the effects of new human resource management practices on economic performance of businesses in different industries.

### **Case Studies**

Case studies offer an additional source of information on the relationship between new human resource management practices and business performance in other industrial settings. Several well-executed case studies exist, most notably perhaps the classic studies of the NUMMI auto assembly plant in Fremont, California (Krafcik, 1988; Wilms, 1995). NUMMI evolved when a shut-down General Motors plant was reopened as a joint venture between GM and Toyota, employing many of the same GM workers, but under Toyota management. Work organization changed from traditional work practices based on a large number of narrow job classifications to team-based work organization under NUMMI. The new labor contract for NUMMI eliminated many traditional industry work rules, replaced wages tied to job classes with one wage rate for unskilled hourly workers, and made developing and maintaining multiple avenues for labor-management communication a high priority. With the adoption of multiple human resource management innovations, drastically improved levels of auto assembly performance were realized. Other case studies exist for paper manufacturing (Ichniowski, 1992), apparel manufacturing (Berg, Appelbaum, Bailey and Kalleberg, 1996) and the manufacturing operations of a single office machine company (Cutcher-Gershenfeld, 1991).

Although these traditional case study findings are very much in keeping with the set of results from the steel industry, case studies are always subject to the limitations that they do not empirically assess whether there are gains from changing human resources management practices and do not allow the analyst to identify whether some other changes that occurred around the same time as the changes in work practices were part of the reason for any improved performance. For example, even though most of the same employees who worked for General Motors kept their jobs for NUMMI, the changes in performance after the change from GM to NUMMI occurred after a plant closing, after new management took over opera-

tions and after new production methods were instituted. The case study method cannot address whether the new human resource management practices, enacted without a plant shutdown and without new management, would have had the same effect. Broader samples of workplaces, such as those used in the insider-econometric steel industry studies, are needed to test whether new human resource management systems have effects on performance that are independent of other factors, such as changes in management teams.

### **Insider-Econometric Case Studies**

In the last few years, economists have moved beyond traditional qualitative case studies and have sought data from within firms that can be used to estimate the effects of “natural experiments” in organizational change. Most of these studies focus on incentive pay. Lazear (2000) studies the effects of piece-rate pay and finds substantially improved performance among workers who install windshields. Freeman and Kleiner (1998) also study piece-rate pay, finding it raises productivity in shoe production, but lowers overall performance. Nagin, Rebitzer, Sanders and Taylor (2002) find that piece-rate pay is very effective in call centers, but requires careful measurement of output. Others have looked at the effects of other human resource management policies. Hamilton, Nickerson and Owan (forthcoming) find that teamwork and communication raise performance for apparel production, as is also the case for Continental Airlines (Knez and Simester, 2001) and banking (Bartel, 2000).

These studies typically share several common features. First, they often identify instances where multiple organizational practices are complementary in improving performance—factors such as combined incentive pay and teamwork in airlines (Knez and Simester, 2001), or combined module production, teamwork and incentive pay in apparel (Hamilton, Nickerson and Owan, forthcoming). Second, these studies examine the underlying causes of the changes in performance, often focusing on worker selection. After the move to piece rates in Lazear’s (2000) windshield installation company, workers self-selected—that is, poor performers left and high-performing ones stayed or arrived. It is important to control for this selection effect and to document the degree to which performance gains arise from selection (in Lazear’s case, selection accounts for nearly half the gains). Insider-econometric case studies provide a very rich picture of why organizational changes raise performance, though of course these studies cannot tell us whether the gains are replicable across companies—for that we turn to broader samples of firms that extend across companies.

### **Intra-Industry Analyses of Additional Industries**

The research method we pursued in the steel finishing industry has been utilized to varying degrees in other intra-industry studies of the effects of human resource management practices on business performance.<sup>9</sup> MacDuffie (1995) and

<sup>9</sup> In addition to those described below, see also Rebitzer (1995).

MacDuffie and Pil (1996) analyze work practices and performance in a sample of 57 nonluxury auto assembly plants in nine different countries. The highest levels of productivity and product quality in auto assembly plants exist in plants with innovative work organization policies such as teamwork and broadly defined job definitions, innovative human resource management practices in compensation and skill development, coupled with “lean manufacturing” production practices typical of Japanese automakers. Evidence from this industry indicates that innovative work practices are highly correlated and seem to promote superior performance, but in this case, they are also coupled with production methods that are compatible with the new human resource management practices.

Dunlop and Weil (1996) analyze apparel manufacturers who make certain categories of clothing. They identify two different forms of work organization: module production and bundle production. Module production employs team oriented job design, broader sets of tasks for each worker to perform, more skills training and group incentive pay that often bases pay on several measures of performance. In contrast, bundle production is characterized by more traditional work practices, including piece-rate pay for completing specific parts of garments and specialization in producing certain pieces. Module production is adopted by apparel manufacturers that produce for quick turnaround in smaller batches based on orders received through computer-aided supply chain information systems from large retailers. Plants with this method of production that are part of larger computer-aided supply chains appear to enjoy higher levels of business profitability, lower costs (Appelbaum, Bailey, Berg and Kalleberg, 2000) and lower inventories (Hwang and Weil, 1998) than do plants with bundle production.

Kelley (1996) studies metalworking and machining shops. This analysis finds that practices like labor-management committees, autonomous work teams and pay-for-performance compensation schemes are often adopted together. Plants that use these practices exhibit higher levels of machining productivity than do plants that rely on more traditional work practices. The lone exception to this broad pattern in machine shop operations is that single-plant operations do not appear to enjoy any performance advantage when more innovative work practices are employed.

Batt (1999) offers the first evidence in this area on service sector operations. This study analyzes customer service and sales workers in 68 work groups in a large unionized regional Bell operating company. Batt contrasts performance of work groups organized in traditional mass production methods with work groups in team-based work organization. Among customer service workers, sales were as much as 20 percent higher under team-based work organization. In both customer service and network service areas, employees in team-based work organization produce higher levels of service quality than do employees under traditional work organization.

Human resource practices for white collar workers are less extensively studied, with the exception of executive pay (for example, Murphy, 1999). However, scientists working in the pharmaceutical industry clearly respond to promotion-based incentives and internal organizational practices that enhance their networking



(Cockburn, Henderson and Stern, 1999; Cockburn and Henderson, 1999), and the promotion schemes for law firms are aimed at attracting and retaining the best talent (Landers, Rebitzer and Taylor, 1996).

### **National Cross-Industry Studies**

Several studies have used nationwide survey data on businesses in diverse industries to relate human resource management practices to economic performance. Over time, studies using this survey-based methodology have addressed methodological concerns more and more convincingly. Initial cross-section surveys of limited numbers of U.S. firms or business units (Ichniowski, 1990; Huselid, 1995) were followed by analyses of more comprehensive cross-sections of establishments from more rigorous surveys (Black and Lynch, 2001).<sup>10</sup> Resurveying respondents from initial surveys generated longitudinal data for before-after tests of the effects of new adoptions of human resource management innovations on changes in performance (Cappelli and Neumark, 2001; Huselid and Becker, 1996; Black and Lynch, 2000). These studies vary in terms of how human resource management innovations are measured (clusters of work practices, number of practices adopted or variables for individual human resource management practices and interactions between human resource management practices), in terms of level of analysis (establishments, business units or firms) and in terms of the availability of longitudinal data (cross-sections, longitudinal changes over many years and longitudinal changes over a few years).

Despite these differences, two main themes documented in intra-industry studies continue to gain support in these nationwide, cross-industry analyses of human resource management practices and economic performance. First, firms tend to use multiple human resource management innovations. Second, new work practices, and, more specifically, interactions among new work practices, are associated with higher business performance. Indeed, these two basic themes appear to hold for businesses in other countries outside the United States, as well. For example, research is available for Denmark (Eriksson, 2001), France (Greenan and Guellec, 1997; Mariette and Greenan, 1999), Italy (Leoni, Cristini, Labory and Gaj, 2001) and Great Britain (Michie and Sheehan, 1999; Millward, Bryson and Forth, 2000).

While these nationwide, cross-industry business surveys provide additional evidence on the question of the performance effects of new human resource management practices, they provide little direct evidence on why some firms adopt new human resource management practices and others do not. Remember the finding from steel industry research on minimills that production line complexity favors the use of team-based work systems. Without focusing on a specific process context, like steel finishing, it is difficult to see how the analyst could construct

<sup>10</sup> These papers focus on human resource management strategies, but a broader literature includes other organizational practices—see Gans, Hsu and Stern (2000) and Greenstein (2000) for organizational strategies for new firms.

useful measures of complexity that could be applied across businesses in all industrial settings.

### **Barriers to Broader Adoption: Transition Costs, Interactions with Information Technologies and the Value of Adoption**

These findings of improved performance due to the adoption of sets of innovative human resource practices again lead naturally to the question of why more businesses do not adopt performance-enhancing practices. Research outside the steel industry has also considered the two broad categories of explanations for limited adoption of innovative work practices—search costs or transition costs incurred when switching from traditional to innovative practices, and workplace-specific factors that limit the productivity benefits of new work practices among the nonadopters.

One line of research argues that search costs can be a particularly large transition cost for firms considering switching to innovative human resource management practices, precisely because complementarities exist among innovative practices. Systems of innovative human resource practices, not individual practices, raise performance, and in some industries, systems of innovative human resource management practices are coupled with other management policies to raise performance (such as the use of production and inventory management policies in auto assembly plants; MacDuffie, 1995). Levinthal (1997) uses simulations to illustrate how businesses can get “locked in” to an existing set of organizational policies that produce less than the highest levels of performance when complementarities exist among the organizational policies. Managers who begin with an inherited set of human resource management practices may search for better policy choices by experimenting with changes in only one or two policy areas. When broader complementarities exist among a large number of policies, performance will not improve and managers may then abandon their search for better practices. This kind of costly search would limit the adoption of innovative work practices.

Concerning workplace-specific factors that affect the value of innovative human resource management practices, several studies argue that innovative work practices are more effective in businesses that adopt new computer-aided information technologies. If new human resource management practices and computer-based information technologies are complementary, then the benefits of improved productivity due to new human resource management practices would be concentrated among businesses that have invested in the new information technologies. Some evidence from case studies, intra-industry studies and national surveys of businesses can be marshaled in support of this idea.

Milgrom and Roberts (1990) report cases of complementarity between innovative human resource management policies and new information technologies, such as Ford’s joint adoption of computer-assisted design and manufacturing techniques along with a team approach to design and manufacturing. Among

comparisons of establishments in the same industry, Dunlop and Weil (1996) find that the main force behind the adoption of “modular” apparel manufacturing (which relies on a set of innovative human resource management practices) was the implementation of computer-aided information systems used to track sales by large retailers. Adopters of new human resource management practices were often tied directly to large modern retailers, while plants that adopted new work practices without the new tracking and distribution methods later abandoned the new human resource management practices. Bresnahan and Greenstein (1997) show that the adoption and value of information technology networks depend on organizational characteristics such as team use. See also Hubbard (2000) and Baker and Hubbard (forthcoming) for tracking results. Finally, several recent studies using nationwide, cross-industry business surveys find higher performance among businesses that adopt both innovative work practices and some computer technologies (Brynjolfsson and Hitt, 2000; Bresnahan, Brynjolfsson and Hitt, 2002; Brynjolfsson, Hitt and Yang, 2002; Black and Lynch, 2000, 2001; Barua and Mukhopadhyay, 2000).

The idea that new computer technologies favor the use of innovative human resource management practices does not necessarily imply that innovative work practices exist only in workplaces with high levels of computerization. In some industries, the effect of innovative human resource management practices may be the same with or without new computer technologies, while in others, the effect of the new work practices may be smaller without new technologies, but still be positive. For example, in the steel industry samples, while we find a modest positive cross-sectional correlation between measures of computerization and the use of innovative human resource management practices,<sup>11</sup> there is no longitudinal correlation between new investments in computer technology and the adoption of human resource management practices within mills over time. Thus, the fixed-effects estimates of productivity gains arising from human resource management innovations in these steel industry samples are independent of the effects of new computer technology. Interviews with managers also corroborate the conclusion that new human resource management practices were innovations undertaken independently of technology investments in these steel finishing facilities.

Still, if new computer technologies do enhance the value of innovative human resource management practices in some workplaces, this relationship could account for the rapid rise in the use of innovative work practices since the early 1980s.<sup>12</sup> New information technologies also became increasingly common since

<sup>11</sup> While the steel industry studies did not focus specifically on computerization of the lines, we constructed a “degree of computerization” index for lines in integrated mills, and the cross-mill correlation between that index and the “degree of human resource management innovation” is +0.23. In minimills, 46 percent of lines with innovative human resource management use information technology-intensive scales, whereas 26 percent of all other mills use such scales.

<sup>12</sup> The joint adoption of new computer technology and innovative human resource management practices would also be consistent with the rising demand for more skilled workers over this period. Several studies document widespread increases in the demand for problem-solving skills that are correlated with new technology investments (Black and Lynch, 1996; Autor, Levy and Murnane, 2002;

1980, as the cost of a computer performing one million instructions per second fell from \$100 to less than 20 cents, and the cost of a megabyte of hard disk storage fell from \$100 to less than 1 cent during this time. The adoption of information technologies grew dramatically over this period. Between 1995 and 1999, firms' investment in computers and software grew at an extraordinary 28 percent annual rate (Council of Economic Advisors, 2001).

While innovative human resource management practices can have effects on productivity that are independent of new computer-based information technologies, new information technology investments appear to accelerate the demand for new human resource management practices in many settings. The adoption of new computer technologies and new forms of work organization imply that a sweeping organizational transformation occurred in many U.S. workplaces in the 1980s and 1990s. As we saw in the worker-level research in the steel industry, these changes in turn imply an overhaul of work relationships. Taken together, these broad organizational changes may be too costly for some businesses to implement relative to their expected value, thereby explaining why innovative human resource management practices are not more broadly diffused throughout the economy.

Overall, the broad-based adoption of new human resources management practices by American businesses over the last 20 years suggests that many businesses find that these practices have the kinds of beneficial performance effects documented in the growing body of insider-econometric studies on this topic. Still, these practices have by no means been adopted universally by U.S. businesses. Transition costs, complementarities with new information technologies and intra-industry characteristics that reduce the value of these practices are factors that will determine and limit that ultimate spread of these practices. As described in the minimill steel study above, not all firms should benefit equally from these practices, and we find that more complex production processes benefit the most. While little work has been done on adoption thus far, Kleiner, Leonard and Pilarski (1999) provide an example of the value of traditional practices. While the steel studies suggest that there are net gains in profitability from innovative human resource management practices, it is very difficult to obtain productivity and profitability data in one study to assess this question. However, we believe that additional "insider-econometric" research will be particularly important in generating convincing estimates of the net economic value of these practices to different businesses and will be a particularly effective method for identifying whether productivity benefits are offset by various costs of these practices such as the direct costs of these practices, transition costs or increased payroll costs.

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Abowd, Haltiwanger, Lane and Sandusky, 2001). Innovative human resource management practices are designed to make use of exactly these sorts of skills. Industry studies, containing detailed descriptions of hiring changes in workplaces that adopt new technologies, add corroborating evidence of a connection between new work practices and an increased demand for problem-solving skills (Bartel, Ichniowski and Shaw, 2001; Autor, Levy and Murnane, 2001; Appelbaum, Bailey, Berg and Kalleberg, 2000; Holzer, 1996, 1998).

## **Directions for Empirical Research on Human Resource Management Practices**

The adoption and performance effects of innovative human resource management practices offer a number of intriguing empirical research questions. We have emphasized in this paper the potential value of applied insider-econometric productivity analysis as a method that provides rich and accurate insights into the economic causes and consequences of human resource management practices. New insider econometric studies in other industry settings would add to currently available evidence on the adoption of innovative human resource management practices and the effects of these practices on performance.

However, the narrow focus on single production processes required for applied insider-econometric analysis is both its chief advantage and its chief disadvantage. It provides perhaps the most persuasive estimates of the effects of human resource management practices, but is not generalizable. Thus, future empirical research in this area must continue to broaden the existing evidence, and the Alfred P. Sloan Foundation continues to provide primary support for these studies.<sup>13</sup> In addition to new insider-econometric studies, richer and more comprehensive data from broader surveys of establishments will help produce more general results, as has been done in the recent work of Black and Lynch (2000), Bresnahan, Brynjolffson and Hitt (2002) and Brynjolffson, Hitt and Yang (2002).

We also suspect there is a fertile middle ground for interplay between insider-econometric studies and broader empirical approaches. For example, broader surveys can focus on specific industries, and these surveys can be tailored to those industries after analysts gain insights from field research in a few businesses in those industries. Alternatively, insights from insider-econometric studies should be used to direct the points of emphasis in broader surveys, and several studies along these lines are being sponsored by the Russell Sage Foundation and the Rockefeller Foundation. Another promising approach can be found in studies that link employee and employer data.<sup>14</sup> These studies, we believe, also hold great potential for analyzing such workplace-level outcomes as productivity, skill demand, human resource management practices and information technology investments.

The problem of designing organizations to get the best performance from their workers is a complex managerial issue. Convincing economic analysis of this problem must acknowledge these complexities. It is not simply a matter of finding the optimal level of human capital investment for individual workers. An individual worker with a given amount of education and work experience can be a high- or low-quality worker depending on the nature of the work environment. The

<sup>13</sup> The Sloan Foundation has provided the key support since 1990 through their Industry Centers and their pin-factory project at the National Bureau of Economic Research. See Helper (2000) for a description of these projects and a discussion of methodological approaches.

<sup>14</sup> For the United States, see Abowd, Haltiwanger and Lane (2002), and for studies of European firms, see Chennells and Van Reenan (2002), Caroli and Van Reenan (1999), Borghans and Weel (2001), Mairesse and Greenan (1999), Greenan and Guellec (1997) and Abowd, Kramarz and Margolis (1999).

research reviewed here suggests that this problem of creating a productive work environment is a multidimensional decision that forces managers to craft a web of human resource management practices that motivate workers to contribute effort and ideas to the goals of their firms.

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## References

- Abowd, John, John Haltiwanger and Julia Lane.** 2002. "From Workshop Floor to Workshop Clusters." Report to the Alfred P. Sloan Foundation.
- Abowd, John, Francis Kramarz and David Margolis.** 1999. "High Wage Workers and High Wage Firms." *Econometrica*. March, 67:2, pp. 251–334.
- Abowd, John, John Haltiwanger, Julia Lane and Kristin Sandusky.** 2001. "Within and Between Firm Changes in Human Capital, Technology, and Productivity." Working paper.
- Aoki, Masahiko.** 1988. *Information, Incentives and Bargaining in the Japanese Economy*. New York: Cambridge University Press.
- Appelbaum, Eileen, Thomas Bailey, Peter Berg and Arne Kalleberg.** 2000. *Manufacturing Advantage: Why High-Performance Work Systems Pay Off*. Ithaca, N.Y.: Cornell University Press.
- Athey, Susan and Scott Stern.** 1998. "An Empirical Framework for Testing Theories about Complementarity in Organizational Design." NBER Working Paper No. 6600.
- Athey, Susan and Scott Stern.** 2002. "The Impact of Information Technology on Emergency Health Outcomes." *Rand Journal of Economics*. Autumn, 33:3, pp. 399–432.
- Autor, David, Frank Levy and Richard Murnane.** 2002. "Upstairs, Downstairs: Computers and Skills on Two Floors of a Large Bank." *Industrial and Labor Relations Review*. April, 55:3, pp. 432–47.
- Autor, David, Frank Levy and Richard Murnane.** Forthcoming. "The Skill Content of Recent Technological Change: An Empirical Exploration." *Quarterly Journal of Economics*.
- Baker, George.** 1992. "Incentive Contracts and Performance Measurement." *Journal of Political Economy*. June, 100:2, pp. 598–614.
- Baker, George and Thomas Hubbard.** Forthcoming. "Make versus Buy in Trucking: Asset Ownership, Job Design and Information." *American Economic Review*.
- Baker, George, Robert Gibbons and Kevin Murphy.** 1994. "Subjective Performance Measures in Optimal Incentive Contracts." *Quarterly Journal of Economics*. November, 109:4, pp. 1125–156.
- Baker, George, Robert Gibbons and Kevin Murphy.** 2002. "Relational Contracts and the Theory of the Firm." *Quarterly Journal of Economics*. February, 117:1, pp. 39–84.
- Baker, George, Michael Gibbs and Bengt Holmstrom.** 1994. "The Wage Policy of a Firm." *Quarterly Journal of Economics*. November, 109:4, pp. 921–55.
- Bartel, Ann.** 1995. "Training, Wage Growth, and Job Performance: Evidence from a Company Database." *Journal of Labor Economics*. 13:3, pp. 401–25.

- Bartel, Ann.** 2000. "Human Resource Management and Performance in the Service Sector: The Case of Bank Branches." NBER Working Paper No. 7467, January.
- Bartel, Ann, Casey Ichniowski and Kathryn Shaw.** 2001. "New Technology, Human Resource Practices and Skill Requirements: Evidence from Plant Visits in Three Industries." Working paper.
- Barua, Anitesh and Tridas Mukhopadhyay.** 2000. "Information Technology and Business Performance: Past, Present and Future," in *Framing the Domains of IT Management*. Robert W. Zmud, ed. Cincinnati, Ohio: Pinnaflex Educational Resources, Inc., pp. 65–84.
- Batt, Rosemary.** 1999. "Work Organization, Technology, and Performance in Customer Services and Sales." *Industrial and Labor Relations Review*. July, 52:4, pp. 539–64.
- Becker, Brian and Mark Huselid.** 1996. "Methodological Issues in Cross-Sectional and Panel Estimates of the Human Resource-Firm." *Industrial Relations*. 35:3, pp. 400–22.
- Becker, Brian and Mark Huselid.** 1998. "High Performance Work Systems and Firm Performance: A Synthesis of Research and Managerial Implications," in *Research in Personnel and Human Resource Management, Volume 16*. G. Ferris, ed. Stamford, Conn., and London: JAI Press, pp. 53–101.
- Berg, Peter, Eileen Appelbaum, Thomas Bailey and Arne Kalleberg.** 1996. "The Performance Effects of Modular Production in the Apparel Industry." *Industrial Relations*. July, 35:3, pp. 356–73.
- Black, Sandra and Lisa Lynch.** 1996. "Human Capital Investments and Productivity." *American Economic Review*. May, 86:2, pp. 263–67.
- Black, Sandra and Lisa Lynch.** 2000. "What's Driving the New Economy: The Benefits of Workplace Innovation." NBER Working Paper No. 7479.
- Black, Sandra and Lisa Lynch.** 2001. "How to Compete: The Impact of Workplace Practices and Information Technology on Productivity." *Review of Economics and Statistics*. August, 83:3, pp. 434–45.
- Boning, Brent, Casey Ichniowski and Kathryn Shaw.** 2001. "Opportunity Counts: Teams and the Effectiveness of Production Incentives." NBER Working Paper No. 8306, May.
- Borghans, Lex and Bas ter Weel.** 2001. "Computers, Skills and Wages." Working paper, Maastricht University, May.
- Bresnahan, Timothy and Shane Greenstein.** 1997. "Technical Progress and Co-Invention in Computing and in the Uses of Computers." *Brookings Papers on Economic Activity: Microeconomics*. pp. 1–78.
- Bresnahan, Timothy, Erik Brynjolfsson and Loren Hitt.** 2002. "Information Technology, Work Organization and the Demand for Skilled Labor: Firm-Level Evidence." *Quarterly Journal of Economics*. February, 166, pp. 339–76.
- Brynjolfsson, Erik and Loren Hitt.** 2000. "Beyond Computation: Information Technology, Organizational Transformation, and Business Performance." *Journal of Economic Perspectives*. Fall, 14:4, pp. 23–48.
- Brynjolfsson, Erik, Loren Hitt and Shinkju Yang.** 2002. "Intangible Assets: Computers and Organizational Capital." *Brookings Papers on Economic Activity*. August, 1, pp. 137–98.
- Cappelli, Peter and David Neumark.** 2001. "Do 'High Performance' Work Practices Improve Establishment-Level Outcomes?" *Industrial and Labor Relations Review*. July, 54:4, pp. 737–75.
- Carmichael, H. Lorne and W. Bentley MacLeod.** 1993. "Multi-Skilling, Technical Change, and the Japanese Firm." *Economic Journal*. 103:416, pp. 142–60.
- Caroli, Eve and John Van Reenen.** 1999. "Human Capital and Organizational Change: Evidence from British and French Establishments in the 1980s and 1990s." Working paper, May.
- Che, Yeon-Koo and Seung-Weon Yoo.** 2001. "Optimal Incentives for Teams." *American Economic Review*. June, 91:3, pp. 525–41.
- Chennells, Lucy and John Van Reenen.** 1998. "Technological Change and the Structure of Employment and Wages: A Survey of the Microeconomic Evidence," in *Productivity, Inequality and the Digital Economy*. Y. L'Horty, N. Greenan and J. Mairesse, eds. Cambridge, Mass.: MIT Press, pp. 175–223.
- Cockburn, Iain and Rebecca Henderson.** 1999. "Public-Private Interaction and the Productivity of Pharmaceutical Research." NBER Working Paper No. 6018, June.
- Cockburn, Iain, Rebecca Henderson and Scott Stern.** 1999. "Balancing Incentives: The Tension Between Basic and Applied Research." NBER Working Paper No. 6882, January.
- Cole, Robert E.** 2000. "Market Pressures and Institutional Forces: The Early Years of the Quality Movement," in *The Quality Movement and Organization Theory*. Robert E. Cole and W. Richard Scott, eds. Thousand Oaks, Calif.: Sage Publications, Inc., pp. 67–88.
- Council of Economic Advisers.** 2001. *The Economic Report of the President, 2001*. Washington, D.C.: Government Printing Office.
- Cutcher-Gershenfeld, Joel.** 1991. "The Impact on Economic Performance of a Transformation

- in Workplace Industrial Relations." *Industrial and Labor Relations Review*. January, 44:2, pp. 241–60.
- Dunlop, John and David Weil.** 1996. "Diffusion and Performance of Modular Production in the U.S. Apparel Industry." *Industrial Relations*. July, 35:3, pp. 334–54.
- Eriksson, Tor.** 2001. "The Effects of New Work Practices: Evidence from Employer-Employee Data." Paper presented at the International Conference on Organizational Design, Management Styles, and Firm Performance, University of Bergamo.
- Freeman, Richard B. and Morris Kleiner.** 1998. "The Last American Shoe Manufacturers: Changing the Method of Pay to Survive Foreign Competition." NBER Working Paper No. 6750, October.
- Gans, Joshua, David Hsu and Scott Stern.** 2000. "When Does Start-Up Innovation Spur the Gale of Creative Destruction?" *Rand Journal of Economics*. Winter, 33:4, pp. 571–86.
- Gant, Jon, Casey Ichniowski and Kathryn Shaw.** 2000. "Working Smarter by Working Together: Human Resource Practices and the Connective Capital of the Firm." Working paper, Carnegie Mellon University.
- Gant, Jon, Casey Ichniowski and Kathryn Shaw.** 2002. "Social Capital and Organizational Change in High-Involvement and Traditional Work Organizations." *Journal of Economics and Management Strategy*. Summer, 11, pp. 289–328.
- Geanakoplos, John and Paul Milgrom.** 1991. "A Theory of Hierarchies Based on Limited Attention Span." *Journal of the Japanese and International Economics*. 5, pp. 205–25.
- Gibbons, Robert.** 1998. "Incentives in Organizations." *Journal of Economic Perspectives*. Fall, 12:4, pp. 115–32.
- Gibbons, Robert and Michael Waldman.** 1999. "Careers in Organizations: Theory and Evidence," in *Handbook of Labor Economics, Volumes III and IV*. O. Ashenfelter and D. Card, eds. New York: North Holland, pp. 2373–437.
- Gittleman, Maury, Michael Horrigan and Mary Joyce.** 1998. "Flexible Workplace Practices: Evidence from a Nationally Representative Survey." *Industrial and Labor Relations Review*. October, 52:1, pp. 99–115.
- Greenan, Nathalie and Dominique Guellec.** 1997. "Firm Organization, Technology and Performance: An Empirical Study." *Economics of Innovation and New Technology*. 6:4, pp. 313–47.
- Greenstein, Shane.** 2000. "Building and Delivering the Virtual World: Commercializing Services for Internet Access." NBER Working Paper No. 7690, May.
- Hamilton, Barton, Jack Nickerson and Hideo Owan.** Forthcoming. "Team Incentives and Worker Heterogeneity: An Empirical Analysis of the Impact of Teams on Productivity and Participation." *Journal of Political Economy*.
- Helper, Susan.** 2000. "Economists and Field Research: 'You Can Observe a Lot Just by Watching.'" *American Economic Review*. May, 90, pp. 228–32.
- Holmstrom, Bengt.** 1982. "Moral Hazard in Teams." *Bell Journal of Economics*. 13, pp. 324–40.
- Holmstrom, Bengt and Paul Milgrom.** 1991. "Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership and Job Design." *Journal of Law, Economics and Organization*. 7, pp. 24–52.
- Holmstrom, Bengt and Paul Milgrom.** 1994. "The Firm as an Incentive System." *American Economic Review*. September, 84:4, pp. 972–91.
- Holzer, Harry.** 1996. *What Employers Want: Job Prospects for Less-Educated Workers*. New York: Russell Sage Foundation.
- Holzer, Harry J.** 1998. "Employer Skill Demands and Labor Market Outcomes of Blacks and Women." *Industrial and Labor Relations Review*. October, 52:1, pp. 82–98.
- Hubbard, Thomas.** 2000. "The Demand for Monitoring Technologies: the Case of Trucking." *Quarterly Journal of Economics*. May, 114, pp. 533–60.
- Huselid, Mark A.** 1995. "The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance." *Academy of Management Journal*. 38:3, pp. 635–72.
- Huselid, Mark A. and Brian E. Becker.** 1996. "Methodological Issues in Cross-Sectional and Panel Estimates of the Human Resource-Firm Performance Link." *Industrial Relations*. July, 35:3, pp. 400–22.
- Hwang, Margaret and David Weil.** 1998. "Who Holds the Bag? The Impact of Information Technology and Workplace Practices on Inventory." *Proceedings of the Industrial Relations Research Association*. Winter, 1, pp. 68–77.
- Ichniowski, Casey.** 1990. "Human Resource Management Systems and the Performance of U.S. Manufacturing Businesses." NBER Working Paper No. 3449.
- Ichniowski, Casey.** 1992. "Human Resource Practices and Productive Labor-Management Relations," in *Research Frontiers in Industrial Relations and Human Resources*. David Lewin, Olivia Mitchell and Peter Sherer, eds. Madison, Wisc.: IRRRA, pp. 239–71.
- Ichniowski, Casey and Kathryn Shaw.** 1995. "Old Dogs and New Tricks: Determinants of the Adoption of Productivity-Enhancing Work Practices." *Brookings Papers, Microeconomics*. pp. 1–55.



- Ichniowski, Casey and Kathryn Shaw.** 1999. "The Effects of Human Resource Systems on Productivity: An International Comparison of U.S. and Japanese Plants." *Management Science*. May, 45, pp. 704–22.
- Ichniowski, Casey and Kathryn Shaw.** 2000. "TQM Practices and Innovative HR Practices: New Evidence on Adoption and Effectiveness," in *The Quality Movement in America: Lessons from Theory and Research*. Robert Cole and Richard Scott, eds. New York: Russell Sage, pp. 347–66.
- Ichniowski, Casey, John T. Delaney and David Lewin.** 1989. "The New Human Resource Management in U.S. Workplaces: Is It Really New and Is It Only Nonunion?" *Relations Industrielles*. 44:1, pp. 97–119.
- Ichniowski, Casey, Kathryn Shaw and Giovanna Prennushi.** 1997. "The Effects of Human Resource Management Practices on Productivity." *American Economic Review*. June, 87:3, pp. 291–313.
- Ichniowski, Casey, Thomas A. Kochan, David Levine, Craig Olson and George Strauss.** 1996. "What Works at Work: Overview and Assessment." *Industrial and Labor Relations Review*. July, 35:3, pp. 299–333.
- Jensen, Michael C. and William H. Meckling.** 1992. "Specific and General Knowledge and Organizational Structure," in *Contract Economics*. Lars Werin and Hans Wijkander, eds. Oxford: Blackwell, pp. 251–74.
- Kandel, Eugene and Edward Lazear.** 1992. "Peer Pressure and Partnerships." *Journal of Political Economy*. August, 100:4, pp. 801–17.
- Kelley, Mary Ellen.** 1996. "Participative Bureaucracy and Productivity in the Machined Products Sector." *Industrial Relations*. July, 35:3, pp. 374–99.
- Kleiner, Morris, Jonathon Leonard and Adam Pilarski.** 1999. "Do Industrial Relations Affect Plant Performance? The Case of Commercial Aircraft Manufacturing." NBER Working Paper No. 7414, November.
- Knez, Marc and Duncan Simester.** 2001. "Firm-Wide Incentives and Mutual Monitoring at Continental Airlines." *Journal of Labor Economics*. October, 19:4, pp. 743–72.
- Kochan, Thomas A., Harry C. Katz and Robert B. McKersie.** 1986. *The Transformation of American Industrial Relations*. New York: Basic Books.
- Krafcik, John.** 1988. "Triumph of the Lean Production System." *Sloan Management Review*. Fall, 30, pp. 41–52.
- Kreps, David.** 1990. "Corporate Culture and Economic Theory," in *Perspectives on Positive Political Economy*. James Alt and Kenneth Shepsle, eds. New York: Cambridge University Press, pp. 90–143.
- Landers, R., James Rebitzer and Lowell Taylor.** 1996. "Rat Race Redux: Adverse Selection in the Determination of Work Hours in Law Firms." *American Economic Review*. June, 86:3, pp. 329–48.
- Lawler, Edward E., Susan A. Mohrman and Gerald E. Ledford Jr.** 1995. *Creating High Performance Organizations: Practices and Results of Employee Involvement and Total Quality Management in Fortune 1000 Companies*. San Francisco, Calif.: Jossey-Bass.
- Lazear, Edward.** 1989. "Pay Equality and Industrial Politics." *Journal of Political Economy*. June, 97:3, pp. 561–80.
- Lazear, Edward P.** 1992. "The Job as a Concept," in *Performance Measurement and Incentive Compensation*. William J. Bruns, Jr., ed. Cambridge: Harvard Business School Press, pp. 183–215.
- Lazear, Edward.** 1995. *Personnel Economics*. Cambridge, Mass.: MIT Press.
- Lazear, Edward.** 1999. "Personnel Economics: Past Lessons and Future Directions." *Journal of Labor Economics*. April, 17, pp. 199–236.
- Lazear, Edward.** 2000. "Performance Pay and Productivity." *American Economic Review*. December, 90:5, pp. 1346–361.
- Lazear, Edward and Sherwin Rosen.** 1981. "Rank-Order Tournaments as Optimum Labor Contracts." *Journal of Political Economy*. 89:5, pp. 841–64.
- Leoni, Riccardo, Annalisa Cristini, Sandrine Labory and Alessandro Gaj.** 2001. "New Work Practices in Italy: Adoption and Performance Effects." Paper presented at the International Conference on Organizational Design, Management Styles, and Firm Performance, University of Bergamo.
- Levinthal, Daniel.** 1997. "Adaptation on Rugged Landscapes." *Management Science*. July, 43, pp. 934–50.
- MacDuffie, John Paul.** 1995. "Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry." *Industrial and Labor Relations Review*. 48:2, pp. 197–221.
- MacDuffie, John Paul and Fritz Pil.** 1996. "The Adoption of High Involvement Work Practices." *Industrial Relations*. 35:3, pp. 423–55.
- MacLeod, Bentley.** 1987. "Behavior and the Organization of the Firm." *Journal of Comparative Economics*. June, 11:2, pp. 207–20.
- MacLeod, Bentley.** 1988. "Equity, Efficiency, and Incentives in Cooperative Teams," in *Advances in the Economic Analysis of Participatory and Labor Managed Firms, Volume 3*. Greenwich, Conn.: JAI Press, pp. 5–23.

- MacLeod, Bentley and Daniel Parent.** 1999. "Job Characteristics and the Form of Compensation." *Research in Labor Economics*. May, 18, pp. 177-242.
- Mairesse, Jacques and Nathalie Greenan.** 1999. "Organizational Change and Productivity in French Manufacturing: What Do We Learn From Firm Representative and Their Employees?" NBER Conference on Organizational Change and Performance Improvement.
- Michie, J. and M. Sheehan.** 1999. "HR Practices, R&D Expenditures and Innovative Investment: Evidence from the U.K.'s Workplace Industrial Relations Survey." *Industrial and Corporate Change*. 8:2, pp. 211-33.
- Milgrom, Paul and John Roberts.** 1990. "The Economics of Modern Manufacturing: Technology, Strategy, and Organizations." *American Economic Review*. June, 80:30, pp. 511-28.
- Milgrom, Paul and John Roberts.** 1995. "Complementarities and Fit: Strategy, Structure, and Organizational Change in Manufacturing." *Journal of Accounting and Economics*. April, 19:2-3, pp. 179-208.
- Millward, N., A. Bryson and J. Forth.** 2000. *All Change at Work?* London: Routledge.
- Morita, Hodaka.** 2001. "Choice of Technology and Labour Market Consequences: An Explanation of U.S.-Japanese Differences." *Economic Journal*. January, 111, pp. 29-50.
- Murphy, Kevin J.** 1999. "Pay, Performance, and Executive Compensation," in *Handbook of Labor Economics, Volume 3B*. New York and Oxford: Elsevier Science, North-Holland, pp. 2485-563.
- Nagin, Daniel, James Rebitzer, Seth Sanders and Lowell Taylor.** 2002. "Monitoring, Motivation and Management: The Determinants of Opportunistic Behavior in a Field Experiment." *American Economic Review*. September, 92:4, pp. 850-73.
- Osterman, Paul.** 1994. "How Common is Workplace Transformation and Who Adopts It?" *Industrial and Labor Relations Review*. 47:2, pp. 173-87.
- Osterman, Paul.** 2000. "Work Reorganization in an Era of Restructuring: Trends in Diffusion and Effects on Employee Welfare." *Industrial and Labor Relations Review*. January, 53:2, pp. 179-96.
- Prendergast, Canice.** 1995. "A Theory of Responsibility in Organizations." *Journal of Labor Economics*. July, 13:3, pp. 387-400.
- Prendergast, Canice.** 1999. "The Provision of Incentives in Firms." *Journal of Economic Literature*. March, 37, pp. 7-63.
- Rebitzer, James.** 1995. "Job Safety and Contract Workers in the Petrochemical Industry." *Industrial Relations*. January, 34:1, pp. 40-57.
- Rosen, Sherwin.** 1982. "Authority, Control, and the Distribution of Earnings." *Bell Journal of Economics*. October, 13, pp. 311-23.
- Wilms, Wilfred.** 1995. *NUMMI: An Ethnographic Study*. New York: The Free Press.
- Zabojnik, Jan.** 2002. "Centralized and Decentralized Decision Making in Organizations." *Journal of Labor Economics*. January, 20:1, pp. 1-22.

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1. Erin L. Kelly, Hazhir Rahmandad, Nathan Wilmers, Aishwarya Yadama. 2023. How Do Employer Practices Affect Economic Mobility?. *ILR Review* **26**. . [[Crossref](#)]
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4. Michael Gibbs, Friederike Mengel, Christoph Siemroth. 2023. Work from Home and Productivity: Evidence from Personnel and Analytics Data on Information Technology Professionals. *Journal of Political Economy Microeconomics* **1**:1, 7-41. [[Crossref](#)]
5. Alberto López. 2023. The role of information technology and workplace organization in firm productivity: evidence from Spanish firms. *Economics of Innovation and New Technology* **80**, 1-17. [[Crossref](#)]
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7. Peng Huang, Marco Ceccagnoli, Chris Forman, D.J. Wu. 2022. IT Knowledge Spillovers, Absorptive Capacity, and Productivity: Evidence from Enterprise Software. *Information Systems Research* **33**:3, 908-934. [[Crossref](#)]
8. Anne-Sophie Larsson, Martin R. Edwards. 2022. Insider econometrics meets people analytics and strategic human resource management. *The International Journal of Human Resource Management* **33**:12, 2373-2419. [[Crossref](#)]
9. Valeria Cirillo, Andrea Ricci. 2022. Heterogeneity matters: temporary employment, productivity and wages in Italian firms. *Economia Politica* **39**:2, 567-593. [[Crossref](#)]
10. Xiqian Cai, Wei Jiang, Hong Song, Huihua Xie. 2022. Pay for performance schemes and manufacturing worker productivity: Evidence from a kinked design in China. *Journal of Development Economics* **156**, 102840. [[Crossref](#)]
11. Gabriel Burdin, Takao Kato. Complementarity in Employee Participation Systems 1-29. [[Crossref](#)]
12. Daniel Aaronson, Scott A. Brave, Ross Cole. 2022. The Detection and Prevention of Cheating: Pay and Performance-enhancing Drugs in Minor League Baseball. *SSRN Electronic Journal* **6**. . [[Crossref](#)]
13. Kathrin Manthei, Dirk Sliwka, Timo Vogelsang. 2021. Performance Pay and Prior Learning—Evidence from a Retail Chain. *Management Science* **67**:11, 6998-7022. [[Crossref](#)]
14. Qing Li, Yanrui Wu. 2021. Organization capital, knowledge spillover and firm performance: evidence from chinese manufacturing sector. *Applied Economics* **53**:49, 5658-5676. [[Crossref](#)]
15. Michael Robinson, Maia Farkas. 2021. The effect of monetary incentives on task attractiveness, effort and performance. *Journal of Applied Accounting Research* **22**:5, 761-779. [[Crossref](#)]
16. Jordi Brandts, Brice Corgnet, Roberto Hernán-González, José M<sup>a</sup> Ortiz, Carles Solà. 2021. Watching or not watching? Access to information and the incentive effects of firing threats. *Journal of Economic Behavior & Organization* **189**, 672-685. [[Crossref](#)]
17. Aisha J Ali, Javier Fuenzalida, Margarita Gómez, Martin J Williams. 2021. Four lenses on people management in the public sector: an evidence review and synthesis. *Oxford Review of Economic Policy* **37**:2, 335-366. [[Crossref](#)]
18. Sanket Sunand Dash. 2021. Behavioural Economics: A New Driver of Strategic HRM. *NHRD Network Journal* **14**:2, 206-215. [[Crossref](#)]

19. Hugh Xiaolong Wu, Shannon X. Liu. 2021. Managerial Attention, Employee Attrition, and Productivity: Evidence from a Field Experiment. *SSRN Electronic Journal* 24. . [[Crossref](#)]
20. Marcel ILIE, Augustin Semenescu. 2021. PERFORMANCE ENHANCEMENT OF MULTI-DISCIPLINARY R&D TEAM THROUGH PROJECT MANAGEMENT. *ANNALS OF THE ACADEMY OF ROMANIAN SCIENTISTS Series on ENGINEERING SCIENCES* 13:1, 59-66. [[Crossref](#)]
21. Seth Carnahan, Jose Uribe, John Meluso, Jesse Austin-Breneman. 2021. Do Employee Absences Help Managers Evaluate Individual Contributions to Team Production? Evidence from Plant Productivity Data. *SSRN Electronic Journal* 109. . [[Crossref](#)]
22. Holger Herz, Christian Zihlmann. 2021. Adverse Effects of Monitoring: Evidence from a Field Experiment. *SSRN Electronic Journal* 105. . [[Crossref](#)]
23. Michael Gibbs, Friederike Mengel, Christoph Siemroth. 2021. Work from Home & Productivity: Evidence from Personnel & Analytics Data on IT Professionals. *SSRN Electronic Journal* 46. . [[Crossref](#)]
24. Michael Gibbs, Friederike Mengel, Christoph Siemroth. 2021. Work from Home & Productivity: Evidence from Personnel & Analytics Data on IT Professionals. *SSRN Electronic Journal* 46. . [[Crossref](#)]
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26. Christina Cregan, Carol T. Kulik, Stewart Johnston, Timothy Bartram. 2021. The influence of calculative (“hard”) and collaborative (“soft”) HRM on the layoff-performance relationship in high performance workplaces. *Human Resource Management Journal* 31:1, 202-224. [[Crossref](#)]
27. Hossam Zeitoun, Paolo Pamini. 2021. A promise made is a promise kept: Union voice, HRM practices, implicit contracts and workplace performance in times of crisis. *Human Resource Management Journal* 31:1, 277-292. [[Crossref](#)]
28. Michael Gibbs, Friederike Mengel, Christoph Siemroth. 2021. Work from Home & Productivity: Evidence from Personnel & Analytics Data on IT Professionals. *SSRN Electronic Journal* 46. . [[Crossref](#)]
29. Palwasha Bibi, Hazrat Bilal, Ashfaq Ahmad, Jawad Hussain. 2020. Effect of Remuneration on Employee Commitment: Empirical Evidence from Hotel Industry. *Journal of Accounting and Finance in Emerging Economies* 6:4, 1069-1075. [[Crossref](#)]
30. Lorenzo Caliendo, Giordano Mion, Luca David Opromolla, Esteban Rossi-Hansberg. 2020. Productivity and Organization in Portuguese Firms. *Journal of Political Economy* 128:11, 4211-4257. [[Crossref](#)]
31. Jason J Sandvik, Richard E Saouma, Nathan T Seegert, Christopher T Stanton. 2020. Workplace Knowledge Flows\*. *The Quarterly Journal of Economics* 135:3, 1635-1680. [[Crossref](#)]
32. Steffen Viete, Daniel Erdsiek. 2020. Mobile Information Technologies and Firm Performance: The Role of Employee Autonomy. *Information Economics and Policy* 51, 100863. [[Crossref](#)]
33. Lucas Figal Garone, Paula A. López Villalba, Alessandro Maffioli, Christian A. Ruzzier. 2020. Firm-level productivity in Latin America and the Caribbean. *Research in Economics* 74:2, 186-192. [[Crossref](#)]
34. Daniel Herbold, Heiner Schumacher. 2020. Relational retention. *Managerial and Decision Economics* 41:4, 490-502. [[Crossref](#)]
35. Florian Englmaier, Stephen Leider. 2020. Managerial Payoff and Gift-Exchange in the Field. *Review of Industrial Organization* 56:2, 259-280. [[Crossref](#)]

36. Prithwiraj Choudhury, Tarun Khanna, Christos A Makridis. 2020. Do Managers Matter? A Natural Experiment from 42 R&D Labs in India. *The Journal of Law, Economics, and Organization* 36:1, 47-83. [[Crossref](#)]
37. Niklas Lollo, Dara O'Rourke. 2020. Factory benefits to paying workers more: The critical role of compensation systems in apparel manufacturing. *PLOS ONE* 15:2, e0227510. [[Crossref](#)]
38. Shaun P. Hargreaves Heap, Kei Tsutsui, Daniel J. Zizzo. 2020. Vote and voice: an experiment on the effects of inclusive governance rules. *Social Choice and Welfare* 54:1, 111-139. [[Crossref](#)]
39. Seraina C. Anagnostopoulou, Argyro Avgoustaki, Beatriz Garcia Osma. 2020. Firm Efforts to Improve Employee Quality and Corporate Investment Efficiency. *SSRN Electronic Journal* . [[Crossref](#)]
40. Sandra Broszeit, Marie-Christine Laible, Holger Görg, Ursula Fritsch. 2019. Management Practices and Productivity in Germany. *German Economic Review* 20:4, e657-e705. [[Crossref](#)]
41. Bryan Hong, Lorenz Kueng, Mu-Jeung Yang. 2019. Complementarity of Performance Pay and Task Allocation. *Management Science* 65:11, 5152-5170. [[Crossref](#)]
42. Claudia Capozza, Marialuisa Divella. 2019. Human capital and firms' innovation: evidence from emerging economies. *Economics of Innovation and New Technology* 28:7, 741-757. [[Crossref](#)]
43. Kathryn Shaw, Anders Sørensen. 2019. The Productivity Advantage of Serial Entrepreneurs. *ILR Review* 72:5, 1225-1261. [[Crossref](#)]
44. Steven Blader, Claudine Gartenberg, Andrea Prat. 2019. The Contingent Effect of Management Practices. *The Review of Economic Studies* 113. . [[Crossref](#)]
45. Neha Gahlawat, Subhash C. Kundu. 2019. Progressive human resource management and firm performance. *International Journal of Organizational Analysis* 27:3, 471-493. [[Crossref](#)]
46. Kannika Sagar. 2019. SHRM: A Research-based Overview for the Practitioner. *NHRD Network Journal* 12:3, 214-224. [[Crossref](#)]
47. Jordan Siegel, Lynn Pyun, B. Y. Cheon. 2019. Multinational Firms, Labor Market Discrimination, and the Capture of Outsider's Advantage by Exploiting the Social Divide. *Administrative Science Quarterly* 64:2, 370-397. [[Crossref](#)]
48. Ruth Stock-Homburg, Matthias Groß. Gestaltung der Personalvergütung 455-486. [[Crossref](#)]
49. John Armour, Mari Sako. 2019. AI-Enabled Business Models in Legal Services: From Traditional Law Firms to Next-Generation Law Companies?. *SSRN Electronic Journal* . [[Crossref](#)]
50. Clement Bellet, Jan-Emmanuel De Neve, George Ward. 2019. Does Employee Happiness Have an Impact on Productivity?. *SSRN Electronic Journal* 22. . [[Crossref](#)]
51. Hugh Xiaolong Wu, Shannon X. Liu. 2019. The Value of Delegation in Hiring. *SSRN Electronic Journal* 24. . [[Crossref](#)]
52. Tahir M. Nisar, Guru Prabhakar, Lubica Strakova. 2019. Social media information benefits, knowledge management and smart organizations. *Journal of Business Research* 94, 264-272. [[Crossref](#)]
53. Florian Englmaier, Nicolai J. Foss, Thorbjørn Knudsen, Tobias Kretschmer. Organization Design and Firm Heterogeneity: Towards an Integrated Research Agenda for Strategy 229-252. [[Crossref](#)]
54. Danny Miller. 2018. Challenging trends in configuration research: Where are the configurations?. *Strategic Organization* 16:4, 453-469. [[Crossref](#)]
55. Cristian Bartolucci, Francesco Devicienti, Ignacio Monzón. 2018. Identifying Sorting in Practice. *American Economic Journal: Applied Economics* 10:4, 408-438. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
56. Hein Bogaard, Jan Svejnar. 2018. Incentive pay and performance: Insider econometrics in a multi-unit firm. *Labour Economics* 54, 100-115. [[Crossref](#)]

57. Victoria Sevchenko, Sendil Ethiraj. 2018. How Do Firms Appropriately Value from Employees with Transferable Skills? A Study of the Appropriation Puzzle in Actively Managed Mutual Funds. *Organization Science* **29**:5, 775-795. [[Crossref](#)]
58. Lea Cassar, Stephan Meier. 2018. Nonmonetary Incentives and the Implications of Work as a Source of Meaning. *Journal of Economic Perspectives* **32**:3, 215-238. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
59. Victor Hiller. 2018. Self-control and the rise and fall of factory discipline. *Journal of Development Economics* **133**, 187-200. [[Crossref](#)]
60. Patrick Kampkötter, Christine Harbring, Dirk Sliwka. 2018. Job rotation and employee performance – evidence from a longitudinal study in the financial services industry. *The International Journal of Human Resource Management* **29**:10, 1709-1735. [[Crossref](#)]
61. Arghya Ghosh, Takao Kato, Hodaka Morita. Employee Involvement Under Rising Competitive Pressure: Evidence from Two Manufacturing Firms in Japan 105-119. [[Crossref](#)]
62. Jocelyn Donze, Trude Gunnes. 2018. Becoming “We” instead of “I”, identity management and incentives in the workplace. *Journal of Economic Behavior & Organization* **148**, 105-120. [[Crossref](#)]
63. Roy Chen, Jie Gong. 2018. Can self selection create high-performing teams?. *Journal of Economic Behavior & Organization* **148**, 20-33. [[Crossref](#)]
64. Magali A. Delmas, Sanja Pekovic. 2018. Organizational Configurations for Sustainability and Employee Productivity: A Qualitative Comparative Analysis Approach. *Business & Society* **57**:1, 216-251. [[Crossref](#)]
65. Matteo Bugamelli, Francesca Lotti, Monica Amici, Emanuela Ciapanna, Fabrizio Colonna, Francesco D'Amuri, Silvia Giacomelli, Andrea Linarello, Francesco Manaresi, Giuliana Palumbo, Filippo Scoccianti, Enrico Sette. 2018. Productivity Growth in Italy: A Tale of a Slow-Motion Change. *SSRN Electronic Journal* . [[Crossref](#)]
66. Prithwiraj Choudhury, Tarun Khanna, Christos Makridis. 2018. (How) Do Managers Matter? A Natural Experiment from 42 R&D Labs in India. *SSRN Electronic Journal* **105** . [[Crossref](#)]
67. Steffen Viete, Daniel Erdsiek. 2018. Trust-Based Work Time and the Productivity Effects of Mobile Information Technologies in the Workplace. *SSRN Electronic Journal* **122** . [[Crossref](#)]
68. Florian Englmaier, Nicolai J. Foss, Thorbjorn Knudsen, Tobias Kretschmer. 2018. Organization Design and Firm Heterogeneity: Towards an Integrated Research Agenda for Strategy. *SSRN Electronic Journal* **34** . [[Crossref](#)]
69. Dimitri Migrow, Francesco Squintani. 2018. Multi-Agent Information Acquisition and Sharing. *SSRN Electronic Journal* . [[Crossref](#)]
70. Adam Seth Litwin, Adrienne E. Eaton. 2018. Complementary or conflictual? Formal participation, informal participation, and organizational performance. *Human Resource Management* **57**:1, 307-325. [[Crossref](#)]
71. Alberto Bayo-Moriones, Jose E. Galdon-Sanchez, Sara Martinez-de-Morentin. 2017. Performance Measurement and Incentive Intensity. *Journal of Labor Research* **38**:4, 496-546. [[Crossref](#)]
72. Brinja Meiseberg, Karim Mignonac, Rozenn Perrigot, Assâad El Akremi. 2017. Performance implications of centrality in franchisee advice networks. *Managerial and Decision Economics* **38**:8, 1227-1236. [[Crossref](#)]
73. . The Work Process and Informal Work Practices 37-67. [[Crossref](#)]
74. . Making a Plan ( Planisa ) and the Production Bonus Scheme: Cooperation or Conflict? 87-122. [[Crossref](#)]

75. Andrea Kim, Kyongji Han, Yongguen Kim. 2017. The relationships among participatory management practices for improving firm profitability: Evidence from the South Korean manufacturing industry. *The International Journal of Human Resource Management* **28**:12, 1712-1738. [[Crossref](#)]
76. Klaus M. Schmidt. 2017. Contributions of Oliver Hart and Bengt Holmström to Contract Theory. *The Scandinavian Journal of Economics* **119**:3, 489-511. [[Crossref](#)]
77. Ricardo Flores-Fillol, Susana Iranzo, Ferran Mane. 2017. Teamwork and delegation of decisions within the firm. *International Journal of Industrial Organization* **52**, 1-29. [[Crossref](#)]
78. Björn Volla, Andreas Landmann, Yexin Zhou, Biliang Hu, Carsten Herrmann-Pillath. 2017. Cooperation and authoritarian values: An experimental study in China. *European Economic Review* **93**, 90-105. [[Crossref](#)]
79. Martin Petrick. 2017. Incentive provision to farm workers in post-socialist settings: evidence from East Germany and North Kazakhstan. *International Food and Agribusiness Management Review* **20**:2, 239-256. [[Crossref](#)]
80. Jens Leth Hougaard, Juan D. Moreno-Ternero, Mich Tvede, Lars Peter Østerdal. 2017. Sharing the proceeds from a hierarchical venture. *Games and Economic Behavior* **102**, 98-110. [[Crossref](#)]
81. Ann P. Bartel, Brianna Cardiff-Hicks, Kathryn Shaw. 2017. Incentives for Lawyers. *ILR Review* **70**:2, 336-358. [[Crossref](#)]
82. Christopher Collins, Rebecca Kehoe. 2017. Examining Strategic Fit and Misfit in the Management of Knowledge Workers. *ILR Review* **70**:2, 308-335. [[Crossref](#)]
83. Joydeep Chatterjee. 2017. Strategy, human capital investments, business-domain capabilities, and performance: a study in the global software services industry. *Strategic Management Journal* **38**:3, 588-608. [[Crossref](#)]
84. Alberto Bayo-Moriones, Margarita Billon, Fernando Lera-López. 2017. Are new work practices applied together with ICT and AMT?. *The International Journal of Human Resource Management* **28**:4, 553-580. [[Crossref](#)]
85. George Georgiadis, Christopher S. Tang. Project Contracting Strategies for Managing Team Dynamics 89-105. [[Crossref](#)]
86. Eric J. Bartelsman, Zoltan Wolf. 2017. Measuring Productivity Dispersion. *SSRN Electronic Journal* **4**. . [[Crossref](#)]
87. Hunt Allcott, Richard L. Sweeney. 2017. The Role of Sales Agents in Information Disclosure: Evidence from a Field Experiment. *Management Science* **63**:1, 21-39. [[Crossref](#)]
88. Spyros Arvanitis, Florian Seliger, Tobias Stucki. 2016. The relative importance of human resource management practices for innovation. *Economics of Innovation and New Technology* **25**:8, 769-800. [[Crossref](#)]
89. Jakša Cvitanić, George Georgiadis. 2016. Achieving Efficiency in Dynamic Contribution Games. *American Economic Journal: Microeconomics* **8**:4, 309-342. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
90. Alexander K. Koch, Julia Nafziger. 2016. Gift exchange, control, and cyberloafing: A real-effort experiment. *Journal of Economic Behavior & Organization* **131**, 409-426. [[Crossref](#)]
91. David C. Chan. 2016. Teamwork and Moral Hazard: Evidence from the Emergency Department. *Journal of Political Economy* **124**:3, 734-770. [[Crossref](#)]
92. Yu-Fang Yen, Hsing-Kuo Wang, William Kao. 2016. High-performance work practices and organisational performance in small firms: the role of guanxi. *Total Quality Management & Business Excellence* **27**:5-6, 628-646. [[Crossref](#)]
93. Hazineh Rahmandad, Nelson Repenning. 2016. Capability erosion dynamics. *Strategic Management Journal* **37**:4, 649-672. [[Crossref](#)]

94. Vathsala Wickramasinghe, G.L.D. Wickramasinghe. 2016. Variable pay and job performance of shop-floor workers in lean production. *Journal of Manufacturing Technology Management* 27:2, 287-311. [[Crossref](#)]
95. Ferry Koster, Rafael Wittek. 2016. Competition and constraint. *Employee Relations* 38:2, 286-303. [[Crossref](#)]
96. Chris Bidner, Guillaume Roger, Jessica Moses. 2016. Investing in Skill and Searching for Coworkers: Endogenous Participation in a Matching Market. *American Economic Journal: Microeconomics* 8:1, 166-202. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
97. Seunghwan Roh, Kyoungwon Seo, Jiyoung Lee, Jihyo Kim, Hokyoung Blake Ryu, ChangHo Jung, HyunWoo Lee, JongHo Shin. Goal-Based Manufacturing Gamification: Bolt Tightening Work Redesign in the Automotive Assembly Line 293-304. [[Crossref](#)]
98. Charles Angelucci. 2016. Motivating Agents to Acquire Information. *SSRN Electronic Journal* . [[Crossref](#)]
99. Alberto Bayo-Moriones, Jonathan Calleja-Blanco, Fernando Lera-López. 2015. The relationship between ICTs and HPWPs across occupations. *International Journal of Manpower* 36:8, 1164-1180. [[Crossref](#)]
100. Edward P. Lazear, Kathryn L. Shaw, Christopher T. Stanton. 2015. The Value of Bosses. *Journal of Labor Economics* 33:4, 823-861. [[Crossref](#)]
101. Bernd Fitzenberger, Grit Muehler. 2015. Dips and Floors in Workplace Training: Gender Differences and Supervisors. *Scottish Journal of Political Economy* 62:4, 400-429. [[Crossref](#)]
102. Oriana Bandiera, Luigi Guiso, Andrea Prat, Raffaella Sadun. 2015. Matching Firms, Managers, and Incentives. *Journal of Labor Economics* 33:3, 623-681. [[Crossref](#)]
103. Avner Ben-Ner, Ting Ren. 2015. Comparing Workplace Organization Design Based on Form of Ownership. *Nonprofit and Voluntary Sector Quarterly* 44:2, 340-359. [[Crossref](#)]
104. Maurus Rischatsch. 2015. Who joins the network? Physicians' resistance to take budgetary co-responsibility. *Journal of Health Economics* 40, 109-121. [[Crossref](#)]
105. Saioa Arando, Monica Gago, Derek C. Jones, Takao Kato. 2015. Efficiency in Employee-Owned Enterprises. *ILR Review* 68:2, 398-425. [[Crossref](#)]
106. G. Georgiadis. 2015. Projects and Team Dynamics. *The Review of Economic Studies* 82:1, 187-218. [[Crossref](#)]
107. Steven Blader, Claudine Madras Gartenberg, Andrea Prat. 2015. The Contingent Effect of Management Practices. *SSRN Electronic Journal* 23. . [[Crossref](#)]
108. Steffen Viete. 2015. Mobile Information and Communication Technologies, Flexible Work Organization and Labor Productivity: Firm-Level Evidence. *SSRN Electronic Journal* 122. . [[Crossref](#)]
109. Giovanni Cerulli, Bianca Potì. The Role of Management Capacity in the Innovation Process for Firm Profitability 455-482. [[Crossref](#)]
110. Takao Kato. High-Involvement Work Systems in Japan, the United States, and Korea: Evidence from Field Research 95-119. [[Crossref](#)]
111. David Dranove, Chris Forman, Avi Goldfarb, Shane Greenstein. 2014. The Trillion Dollar Conundrum: Complementarities and Health Information Technology. *American Economic Journal: Economic Policy* 6:4, 239-270. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
112. Björn Bartling, Ernst Fehr, Holger Herz. 2014. The Intrinsic Value of Decision Rights. *Econometrica* 82:6, 2005-2039. [[Crossref](#)]
113. Chris Bidner. 2014. A spillover-based theory of credentialism. *Canadian Journal of Economics/Revue canadienne d'économique* 47:4, 1387-1425. [[Crossref](#)]



114. Richard Fabling, Arthur Grimes. 2014. The “Suite” Smell of Success. *ILR Review* 67:4, 1095-1126. [[Crossref](#)]
115. Thomas Cornelissen, John S. Heywood, Uwe Jirjahn. 2014. Reciprocity and Profit Sharing: Is There an Inverse U-shaped Relationship?. *Journal of Labor Research* 35:2, 205-225. [[Crossref](#)]
116. Kristina McElheran. 2014. Delegation in Multi-Establishment Firms: Evidence from I.T. Purchasing. *Journal of Economics & Management Strategy* 23:2, 225-258. [[Crossref](#)]
117. Ganime Esra Yuzden, Julide Yildirim. 2014. A Qualitative Evaluation of the Performance-based Supplementary Payment System in Turkey. *Journal of Health Management* 16:2, 259-270. [[Crossref](#)]
118. Ferdinand A. von Siemens, Michael Kosfeld. 2014. Team production in competitive labor markets with adverse selection. *European Economic Review* 68, 181-198. [[Crossref](#)]
119. Paul Jones, Joanne Scherle, David Pickernell, Gary Packham, Heather Skinner, Tom Peisl. 2014. Fool's Gold? The Value of Business Awards to Small Businesses. *The International Journal of Entrepreneurship and Innovation* 15:2, 89-100. [[Crossref](#)]
120. Lex Borghans, Bas Ter Weel, Bruce A. Weinberg. 2014. People Skills and the Labor-Market Outcomes of Underrepresented Groups. *ILR Review* 67:2, 287-334. [[Crossref](#)]
121. M. Freedman, R. Kosova. 2014. Agency and Compensation: Evidence from the Hotel Industry. *Journal of Law, Economics, and Organization* 30:1, 72-103. [[Crossref](#)]
122. C. E. Bishop. 2014. High-Performance Workplace Practices in Nursing Homes: An Economic Perspective. *The Gerontologist* 54:Suppl 1, S46-S52. [[Crossref](#)]
123. Razieh Massrur, Akbar Farhoodi Nejad, Ashkan Sami. The surveying of the effect of the incentive pays to the degree of the attraction of resources in bank branches through the data mining technique 1-6. [[Crossref](#)]
124. Igal Hendel, Yossi Spiegel. 2014. Small Steps for Workers, a Giant Leap for Productivity. *American Economic Journal: Applied Economics* 6:1, 73-90. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
125. Prithwiraj Choudhury. 2014. Return Migration and Geography of Innovation in MNEs: A Natural Experiment of On-the-Job Learning of Knowledge Production by Local Workers Reporting to Return Migrants. *SSRN Electronic Journal* . [[Crossref](#)]
126. Jaksa Cvitanic, George Georgiadis. 2014. Reducing Free-Riding in Dynamic Contribution Games. *SSRN Electronic Journal* . [[Crossref](#)]
127. Thomas Kolaska. 2014. Good Jobs, Screening, and Labour Productivity. *SSRN Electronic Journal* 19. . [[Crossref](#)]
128. Chris Bidner, Guillaume Roger, Jessica Moses. 2014. Investing in Skill and Searching for Coworkers: Endogenous Participation in a Matching Market. *SSRN Electronic Journal* . [[Crossref](#)]
129. Alejandro Artopoulos, Daniel Friel, Juan Carlos Hallak. 2013. Export emergence of differentiated goods from developing countries: Export pioneers and business practices in Argentina. *Journal of Development Economics* 105, 19-35. [[Crossref](#)]
130. Annemarie Künn-Nelen, Andries de Grip, Didier Fouarge. 2013. Is Part-Time Employment Beneficial for Firm Productivity?. *ILR Review* 66:5, 1172-1191. [[Crossref](#)]
131. Suraj Prasad, Hien Tran. 2013. Work practices, incentives for skills, and training. *Labour Economics* 23, 66-76. [[Crossref](#)]
132. Björn Bartling, Ernst Fehr, Klaus M. Schmidt. 2013. JEEA-FBBVA Lecture 2012: USE AND ABUSE OF AUTHORITY: A BEHAVIORAL FOUNDATION OF THE EMPLOYMENT RELATION. *Journal of the European Economic Association* 11:4, 711-742. [[Crossref](#)]
133. George S. Benson, Michael Kimmel, Edward E. Lawler. Adoption of Employee Involvement Practices: Organizational Change Issues and Insights 233-257. [[Crossref](#)]

134. W. Bentley MacLeod. 2013. On Economics: A Review of Why Nations Fail by D. Acemoglu and J. Robinson and Pillars of Prosperity by T. Besley and T. Persson. *Journal of Economic Literature* 51:1, 116-143. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
135. Steve McDonald, S. Michael Gaddis, Lindsey B. Trimble, Lindsay Hamm. Frontiers of Sociological Research on Networks, Work, and Inequality 1-41. [[Crossref](#)]
136. Adam Seth Litwin. 2013. Not Featherbedding, but Feathering the Nest: Human Resource Management and Investments in Information Technology. *Industrial Relations: A Journal of Economy and Society* 52:1, 22-52. [[Crossref](#)]
137. Bernd J. Frick, Ute Goetzen, Robert Simmons. 2013. The Hidden Costs of High-Performance Work Practices: Evidence from a Large German Steel Company. *ILR Review* 66:1, 198-224. [[Crossref](#)]
138. Adam Seth Litwin, Adrienne E. Eaton. 2013. Frontline Employee Involvement and the Mystery of the Missing Performance Effects. *SSRN Electronic Journal* . [[Crossref](#)]
139. Björn Bartling, Ernst Fehr, Holger Herz. 2013. The Intrinsic Value of Decision Rights. *SSRN Electronic Journal* . [[Crossref](#)]
140. Spyros Arvanitis, Florian Seliger, Tobias Stucki. 2013. The Relative Importance of Human Resource Management Practices for a Firm's Innovation Performance. *SSRN Electronic Journal* . [[Crossref](#)]
141. Hein Bogaard, Jan Svejnar. 2013. Incentive Pay and Performance: Insider Econometrics in a Multi-Unit Firm. *SSRN Electronic Journal* . [[Crossref](#)]
142. Dino Ruta, Barbara Imperatori, John Cavenaghi. The Effects of ICT on Sports Fan Management 243-262. [[Crossref](#)]
143. Peng Huang, Marco Ceccagnoli, Chris Forman, D. J. Wu. 2013. IT Knowledge Spillovers and Productivity: Evidence from Enterprise Software. *SSRN Electronic Journal* 53. . [[Crossref](#)]
144. John R. M. Hand. What Drives the Top Line?: Determinants of Sales Revenue in Private Venture-Backed Firms 686-720. [[Crossref](#)]
145. Nabanita Datta Gupta, Tor Eriksson. 2012. HRM Practices and the Within-Firm Gender Wage Gap. *British Journal of Industrial Relations* 50:3, 554-580. [[Crossref](#)]
146. Andries de Grip, Wendy Smits. 2012. What affects lifelong learning of scientists and engineers?. *International Journal of Manpower* 33:5, 583-597. [[Crossref](#)]
147. Chia-Wen Tsai, Pei-Di Shen, Nien-En Chiang. 2012. An Investigation of the Relationship Between Intellectual Capital and Knowledge Transfer. *International Journal of Art, Culture, Design, and Technology* 2:2, 43-56. [[Crossref](#)]
148. Sinan Aral, Erik Brynjolfsson, Lynn Wu. 2012. Three-Way Complementarities: Performance Pay, Human Resource Analytics, and Information Technology. *Management Science* 58:5, 913-931. [[Crossref](#)]
149. Björn Bartling,, Ernst Fehr,, Klaus M. Schmidt. 2012. Screening, Competition, and Job Design: Economic Origins of Good Jobs. *American Economic Review* 102:2, 834-864. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
150. Avner Ben-Ner, Fanmin Kong, Stéphanie Lluís. 2012. Uncertainty, task environment, and organization design: An empirical investigation. *Journal of Economic Behavior & Organization* 82:1, 281-313. [[Crossref](#)]
151. Bruce Ian Carlin, Bhagwan Chowdhry, Mark J. Garmaise. 2012. Investment in organization capital. *Journal of Financial Intermediation* 21:2, 268-286. [[Crossref](#)]
152. Derek C. Jones, Panu Kalmi, Antti Kauhanen. 2012. The effects of general and firm-specific training on wages and performance: evidence from banking. *Oxford Economic Papers* 64:1, 151-175. [[Crossref](#)]

153. Lisa M. Lynch. The Evolving Nature of High Performance Workplace Practices in the United States 207-235. [[Crossref](#)]
154. Francis Green. 2012. Employee Involvement, Technology and Evolution in Job Skills: A Task-Based Analysis. *ILR Review* 65:1, 36-67. [[Crossref](#)]
155. Adam Seth Litwin. 2012. Not Featherbedding, but Feathering the Nest: Human Resource Management and Investments in Information Technology. *SSRN Electronic Journal* . [[Crossref](#)]
156. Matthew Freedman, Renáta Kosová. 2012. Agency and Compensation: Evidence from the Hotel Industry. *SSRN Electronic Journal* . [[Crossref](#)]
157. Hein Bogaard, Jan Svejnár. 2012. Incentive Pay and Performance: Insider Econometrics in a Multi-Unit Bank. *SSRN Electronic Journal* 25. . [[Crossref](#)]
158. Björn Bartling, Ernst Fehr, Klaus M. Schmidt. 2012. Discretion, Productivity, and Work Satisfaction. *SSRN Electronic Journal* . [[Crossref](#)]
159. Edward P. Lazear, Kathryn L. Shaw, Christopher Stanton. 2012. The Value of Bosses. *SSRN Electronic Journal* . [[Crossref](#)]
160. Cristian Bartolucci, Francesco Devicienti. 2012. Better Workers Move to Better Firms: A Simple Test to Identify Sorting. *SSRN Electronic Journal* . [[Crossref](#)]
161. Björn Bartling, Ernst Fehr, Klaus M. Schmidt. 2012. Use and Abuse of Authority: A Behavioral Foundation of the Employment Relation. *SSRN Electronic Journal* 62. . [[Crossref](#)]
162. Florian Englmaier, Stephen Leider. 2012. Managerial Payoff and Gift Exchange in the Field. *SSRN Electronic Journal* . [[Crossref](#)]
163. Mirella Damiani, Fabrizio Pompei, Andrea Ricci. 2012. Labour Shares and Employment Protection in European Economies. *SSRN Electronic Journal* 379. . [[Crossref](#)]
164. Cindy Zoghi, Robert D. Mohr. 2011. The Decentralization of Decision Making and Employee Involvement within the Workplace: Evidence from Four Establishment Datasets. *British Journal of Industrial Relations* 49:4, 688-716. [[Crossref](#)]
165. Feza Tabassum Azmi. 2011. Strategic human resource management and its linkage with HRM effectiveness and organizational performance: evidence from India. *The International Journal of Human Resource Management* 22:18, 3888-3912. [[Crossref](#)]
166. I. M. Bodas Freitas. 2011. Technological learning environments and organizational practices--cross-sectoral evidence from Britain. *Industrial and Corporate Change* 20:5, 1439-1474. [[Crossref](#)]
167. Ferry Koster. 2011. Able, willing, and knowing: the effects of HR practices on commitment and effort in 26 European countries. *The International Journal of Human Resource Management* 22:14, 2835-2851. [[Crossref](#)]
168. Brinja Meiseberg, Thomas Ehrmann. 2011. The impact of communicative efficiency on franchisee performance. *Zeitschrift für Betriebswirtschaft* 81:S4, 81-103. [[Crossref](#)]
169. PANDEJ CHINTRAKARN, YI-YI CHEN. 2011. DO UNIONS IMPACT EFFICIENCY?: EVIDENCE FROM THE U.S. MANUFACTURING SECTOR. *Contemporary Economic Policy* 29:3, 431-440. [[Crossref](#)]
170. Chad Syverson. 2011. What Determines Productivity?.. *Journal of Economic Literature* 49:2, 326-365. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
171. Christopher McGrath, Jennifer Percival. Factors affecting improved innovation output in service sector firms 239-246. [[Crossref](#)]
172. Debabrata Dey, Ming Fan, Gang Peng. 2011. Computer use and wage returns. *ACM Transactions on Management Information Systems* 2:1, 1-21. [[Crossref](#)]

173. W. Bentley MacLeod. Great Expectations: Law, Employment Contracts, and Labor Market Performance 1591-1696. [[Crossref](#)]
174. Björn Bartling, Ernst Fehr, Klaus M. Schmidt. 2011. Screening, Competition, and Job Design: Economic Origins of Good Jobs. *SSRN Electronic Journal* **109**. . [[Crossref](#)]
175. Oriana Bandiera, Luigi Guiso, Andrea Prat, Raffaella Sadun. 2011. Matching Firms, Managers, and Incentives. *SSRN Electronic Journal* **110**. . [[Crossref](#)]
176. Kenju Kamei. 2011. Democracy and Resilient Pro-Social Behavioral Change: An Experimental Study. *SSRN Electronic Journal* . [[Crossref](#)]
177. Bernd Fitzenberger, Grit Mühler. 2011. Dips and Floors in Workplace Training: Using Personnel Records to Estimate Gender Differences. *SSRN Electronic Journal* . [[Crossref](#)]
178. George Georgiadis. 2011. Projects and Team Dynamics. *SSRN Electronic Journal* . [[Crossref](#)]
179. Masayuki Morikawa. 2010. Labor unions and productivity: An empirical analysis using Japanese firm-level data. *Labour Economics* **17**:6, 1030-1037. [[Crossref](#)]
180. Isidro Peña, Manuel Villasalero. 2010. Business strategy, human resource systems, and organizational performance in the Spanish banking industry. *The International Journal of Human Resource Management* **21**:15, 2864-2888. [[Crossref](#)]
181. Naresh Khatri, Alok Baveja, Narendra M. Agrawal, Gordon D. Brown. 2010. HR and IT capabilities and complementarities in knowledge-intensive services. *The International Journal of Human Resource Management* **21**:15, 2889-2909. [[Crossref](#)]
182. William B. Rouse. Human Capital Economics 57-68. [[Crossref](#)]
183. Derek C. Jones, Panu Kalmi, Antti Kauhanen. 2010. Teams, Incentive Pay, and Productive Efficiency: Evidence from a Food-Processing Plant. *ILR Review* **63**:4, 606-626. [[Crossref](#)]
184. Brian P. Cozzarin, Jennifer C. Percival. 2010. IT, productivity and organizational practices: large sample, establishment-level evidence. *Information Technology and Management* **11**:2, 61-76. [[Crossref](#)]
185. Antti Kauhanen, Satu Roponen. 2010. Productivity dispersion: A case study. *Research in Economics* **64**:2, 97-100. [[Crossref](#)]
186. Alberto Bayo-Moriones, Jose Enrique Galdon-Sanchez. 2010. Multinational companies and high-performance work practices in the Spanish manufacturing industry. *The International Journal of Human Resource Management* **21**:8, 1248-1271. [[Crossref](#)]
187. David Marsden, Richard Belfield. 2010. Institutions and the Management of Human Resources: Incentive Pay Systems in France and Great Britain. *British Journal of Industrial Relations* **48**:2, 235-283. [[Crossref](#)]
188. Richard Fabling, Arthur Grimes. 2010. HR practices and New Zealand firm performance: what matters and who does it?. *The International Journal of Human Resource Management* **21**:4, 488-508. [[Crossref](#)]
189. Hannu Piekola. 2010. L'emploi et le travail des seniors : l'expérience nordique à la lumière des exemples finlandais et norvégien. *Revue internationale des sciences sociales* n° **190**:4, 587-599. [[Crossref](#)]
190. Ruth Stock-Homburg. Gestaltung der Personalvergütung 415-447. [[Crossref](#)]
191. Tomohiro Machikita. Industrial Clusters and Workplace Training to Expand Innovation Capability: Evidence from Manufacturing in the Greater Bangkok, Thailand 290-325. [[Crossref](#)]
192. Alberto Bayo-Moriones, Jose E. Galdon-Sanchez, Maia Güell. Is seniority-based pay used as a motivational device? Evidence from plant-level data 155-187. [[Crossref](#)]
193. Naresh Khatri, Kalyan Pasupathy, Lanis L. Hicks. The crucial role of people and information in health care organizations 195-211. [[Crossref](#)]

194. DEREK C. JONES, PANU KALMI, ANTTI KAUKANEN. 2010. How Does Employee Involvement Stack Up? The Effects of Human Resource Management Policies on Performance in a Retail Firm. *Industrial Relations: A Journal of Economy and Society* 49:1, 1-21. [[Crossref](#)]
195. Susanne Neckermann, Reto Cueni, Bruno S. Frey. 2010. Awards at Work. *SSRN Electronic Journal* . [[Crossref](#)]
196. Prithwiraj Choudhury. 2010. Seeking Resources or Seeking Knowledge? A Study of Mobility and Knowledge Creation Using Micro Data. *SSRN Electronic Journal* 6. . [[Crossref](#)]
197. Prithwiraj Choudhury. 2010. Return Migration and Distributed R&D in Multinationals – A Study Using Micro Data. *SSRN Electronic Journal* 6. . [[Crossref](#)]
198. Kristina Steffenson McElheran. 2010. Delegation in Multi-Establishment Firms: The Organizational Structure of I.T. Purchasing Authority. *SSRN Electronic Journal* 122. . [[Crossref](#)]
199. Kathryn Shaw. 2009. Insider econometrics: A roadmap with stops along the way. *Labour Economics* 16:6, 607-617. [[Crossref](#)]
200. Susanna Mancinelli, Massimiliano Mazzanti. 2009. Innovation, networking and complementarity: evidence on SME performances for a local economic system in North-Eastern Italy. *The Annals of Regional Science* 43:3, 567-597. [[Crossref](#)]
201. Andries De Grip, Inge Sieben. 2009. The effectiveness of more advanced human resource systems in small firms. *The International Journal of Human Resource Management* 20:9, 1914-1928. [[Crossref](#)]
202. Jordan I. Siegel, Barbara Zepp Larson. 2009. Labor Market Institutions and Global Strategic Adaptation: Evidence from Lincoln Electric. *Management Science* 55:9, 1527-1546. [[Crossref](#)]
203. Francisco J. Román. 2009. An analysis of changes to a team-based incentive plan and its effects on productivity, product quality, and absenteeism. *Accounting, Organizations and Society* 34:5, 589-618. [[Crossref](#)]
204. Wilma Keighley, Andreas Sewing. 2009. New working paradigms in research laboratories. *Drug Discovery Today* 14:13-14, 625-629. [[Crossref](#)]
205. Rob Simmons, David J. Berri. 2009. Gains from Specialization and Free Agency: The Story from the Gridiron. *Review of Industrial Organization* 34:1, 81-98. [[Crossref](#)]
206. Sharon Novak, Scott Stern. 2009. Complementarity Among Vertical Integration Decisions: Evidence from Automobile Product Development. *Management Science* 55:2, 311-332. [[Crossref](#)]
207. Maria De Paola, Vincenzo Scoppa. 2009. Task assignment, incentives and technological factors. *Managerial and Decision Economics* 30:1, 43-55. [[Crossref](#)]
208. Edgar Ennen, Ansgar Richter. 2009. The Whole is More than the Sum of its Parts - Or is It? A Review of the Empirical Literature on Complementarities in Organizations. *SSRN Electronic Journal* . [[Crossref](#)]
209. Par Sabrina TEYSSIER. 2009. Aptitude, préférences et sélection des travailleurs. *Vie & sciences de l'entreprise* 182:2, 21. [[Crossref](#)]
210. Isaac Getz, Todd Lubart. Creativity and economics 206-221. [[Crossref](#)]
211. Marcos Singer, Patricio Donoso, Carlos Rodríguez-Sickert. 2008. A static model of cooperation for group-based incentive plans. *International Journal of Production Economics* 115:2, 492-501. [[Crossref](#)]
212. Taran Patel, Chirag Patel. 2008. Learning cultures for sustained innovation success. *Innovation: The European Journal of Social Science Research* 21:3, 233-251. [[Crossref](#)]
213. Oriana Bandiera, Iwan Barankay, Imran Rasul. 2008. Social capital in the workplace: Evidence on its formation and consequences. *Labour Economics* 15:4, 724-748. [[Crossref](#)]
214. George P. Baker, Robert Gibbons, Kevin J. Murphy. 2008. Strategic alliances: Bridges between “islands of conscious power”. *Journal of the Japanese and International Economies* 22:2, 146-163. [[Crossref](#)]

215. Jonathan C. Javitt, James B. Rebitzer, Lonny Reisman. 2008. Information technology and medical missteps: Evidence from a randomized trial. *Journal of Health Economics* 27:3, 585-602. [[Crossref](#)]
216. Dominika Wranik. 2008. Health human resource planning in Canada: A typology and its application. *Health Policy* 86:1, 27-41. [[Crossref](#)]
217. Susanne Neckermann, Bruno S. Frey. 2008. Awards as Incentives. *SSRN Electronic Journal* . [[Crossref](#)]
218. Antoinette Weibel, Katja Rost, Margit Osterloh. 2007. Gewollte und ungewollte Anreizwirkungen von variablen Löhnen: Disziplinierung der Agenten oder Crowding-Out?. *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung* 59:8, 1029-1054. [[Crossref](#)]
219. Brent Boning, Casey Ichniowski, Kathryn Shaw. 2007. Opportunity Counts: Teams and the Effectiveness of Production Incentives. *Journal of Labor Economics* 25:4, 613-650. [[Crossref](#)]
220. Ali Tafti, Sunil Mithas, M. S. Krishnan. 2007. Information technology and the autonomy-control duality: toward a theory. *Information Technology and Management* 8:2, 147-166. [[Crossref](#)]
221. John C. Haltiwanger, Julia I. Lane, James R. Spletzer. 2007. Wages, productivity, and the dynamic interaction of businesses and workers. *Labour Economics* 14:3, 575-602. [[Crossref](#)]
222. HWIKWON HAM, MORRIS M. KLEINER. 2007. Do Industrial Relations Institutions Influence Foreign Direct Investment? Evidence from OECD Nations. *Industrial Relations* 46:2, 305-328. [[Crossref](#)]
223. Elke Wolf, Anja Heinze. 2007. How to Limit Discrimination? Analyzing the Effects of Innovative Workplace Practices on Intra-Firm Gender Wage Gaps Using Linked Employer-Employee Data. *SSRN Electronic Journal* 57. . [[Crossref](#)]
224. Karl O. Aarbu, Gaute Torsvik. 2007. Pay and Performance in a Call Centre; Principals and Agents or Principally Angels?. *SSRN Electronic Journal* 115. . [[Crossref](#)]
225. Hannu Piekkola. 2006. Nordic policies on active ageing in the labour market and some European comparisons. *International Social Science Journal* 58:190, 545-557. [[Crossref](#)]
226. Prahlad Kasturi, Alexei G. Orlov, John Roufagalas. 2006. HRM systems architecture and firm performance: Evidence from SMEs in a developing country. *International Journal of Commerce and Management* 16:3/4, 178-196. [[Crossref](#)]
227. Tor Eriksson, Jaime Ortega. 2006. The Adoption of Job Rotation: Testing the Theories. *ILR Review* 59:4, 653-666. [[Crossref](#)]
228. Tracy Taylor, Simon Darcy, Russell Hoyer, Graham Cuskelly. 2006. Using Psychological Contract Theory to Explore Issues in Effective Volunteer Management. *European Sport Management Quarterly* 6:2, 123-147. [[Crossref](#)]
229. A. Amaral. Learning and Adapting to Mobile Technologies: An Intra-organizational Assessment 950-954. [[Crossref](#)]
230. Dilip Mookherjee. 2006. Decentralization, Hierarchies, and Incentives: A Mechanism Design Perspective. *Journal of Economic Literature* 44:2, 367-390. [[Abstract](#)] [[View PDF article](#)] [[PDF with links](#)]
231. Arnaud Dupuy, Andries de Grip. 2006. Elasticity of substitution and productivity, capital and skill intensity differences across firms. *Economics Letters* 90:3, 340-347. [[Crossref](#)]
232. Massimiliano Mazzanti, Paolo Pini, Ermanno Tortia. 2006. Organizational innovations, human resources and firm performance. *The Journal of Socio-Economics* 35:1, 123-141. [[Crossref](#)]
233. Mariacristina Piva, Enrico Santarelli, Marco Vivarelli. 2006. Technological and organizational changes as determinants of the skill bias: evidence from the Italian machinery industry. *Managerial and Decision Economics* 27:1, 63-73. [[Crossref](#)]

234. Nabanita Datta Gupta, Tor Eriksson. High-Performance Work Practices, Incentive Pay Schemes, Worker Evaluation Systems and Male—Female Wages 34-58. [\[Crossref\]](#)
235. Katherine Andresen, Brian H. Kleiner. 2005. Effective human resource management in the steel industry. *Management Research News* **28**:11/12, 32-43. [\[Crossref\]](#)
236. Hannu Piekola. 2005. Performance-related pay and firm performance in Finland. *International Journal of Manpower* **26**:7/8, 619-635. [\[Crossref\]](#)
237. Peter Doeringer, Christine Evans-klock, David Terkla. 2005. Management cultures and regional development: High performance management and the location of new manufacturing plants. *European Planning Studies* **13**:6, 815-830. [\[Crossref\]](#)
238. MARGARET HWANG SMITH, DAVID WEIL. 2005. Ratcheting Up: Linked Technology Adoption in Supply Chains. *Industrial Relations* **44**:3, 490-508. [\[Crossref\]](#)
239. Marvin B. Lieberman, Rajeev Dhawan. 2005. Assessing the Resource Base of Japanese and U.S. Auto Producers: A Stochastic Frontier Production Function Approach. *Management Science* **51**:7, 1060-1075. [\[Crossref\]](#)
240. Kirsten Daniel, W. S. Siebert. 2005. Does employment protection reduce the demand for unskilled labour?. *International Economic Journal* **19**:2, 197-222. [\[Crossref\]](#)
241. Daniel A. Verreault, MaryAnne Hyland. 2005. Evidence for increasing the focus on strategic risk in HRM audits. *Managerial Auditing Journal* **20**:5, 524-543. [\[Crossref\]](#)
242. Andries de Grip \*, Inge Sieben. 2005. The effects of human resource management on small firms' productivity and employees' wages. *Applied Economics* **37**:9, 1047-1054. [\[Crossref\]](#)
243. RICHARD B. FREEMAN, MORRIS M. KLEINER. 2005. The Last American Shoe Manufacturers: Decreasing Productivity and Increasing Profits in the Shift from Piece Rates to Continuous Flow Production\*. *Industrial Relations: A Journal of Economy and Society* **44**:2, 307-330. [\[Crossref\]](#)
244. Mariacristina Piva, Enrico Santarelli, Marco Vivarelli. 2005. The skill bias effect of technological and organisational change: Evidence and policy implications. *Research Policy* **34**:2, 141-157. [\[Crossref\]](#)
245. Debashish Bhattacharjee. 2005. The Effects of Group Incentives in an Indian Firm: Evidence from Payroll Data. *Labour* **19**:1, 147-173. [\[Crossref\]](#)
246. Marvin B. Lieberman, Rajeev Dhawan. 2005. Assessing the Resource Base of Japanese and U.S. Auto Producers: A Stochastic Frontier Production Function Approach. *SSRN Electronic Journal* . [\[Crossref\]](#)
247. W. Bentley Bentley MacLeod. 2005. Regulation or Markets? The Case of Employment Contract. *SSRN Electronic Journal* . [\[Crossref\]](#)
248. John R. M. Hand. 2005. What Drives the Top Line? Nonfinancial Determinants of Sales Revenue in Private Venture-Backed Firms. *SSRN Electronic Journal* . [\[Crossref\]](#)
249. Marie Claire Villeval. 2005. Nouvelles conditions de travail : satisfaction ou résignation ?. *Revue économique* **56**:2, 237. [\[Crossref\]](#)
250. Bruce Kogut, John Paul MacDuffie, Charles Ragin. 2004. Prototypes and strategy: assigning causal credit using fuzzy sets. *European Management Review* **1**:2, 114-131. [\[Crossref\]](#)
251. Martin Gaynor, James B. Rebitzer, Lowell J. Taylor. 2004. Physician Incentives in Health Maintenance Organizations. *Journal of Political Economy* **112**:4, 915-931. [\[Crossref\]](#)
252. Laura Langbein, Connie Jorstad. 2004. Productivity in the Workplace: Cops, Culture, Communication, Cooperation, and Collusion. *Political Research Quarterly* **57**:1, 65-79. [\[Crossref\]](#)
253. D. H. Autor, F. Levy, R. J. Murnane. 2003. The Skill Content of Recent Technological Change: An Empirical Exploration. *The Quarterly Journal of Economics* **118**:4, 1279-1333. [\[Crossref\]](#)

254. Mirella Damiani, Andrea Ricci. Performance-Related Pay, Unions, and Productivity in Italy: Evidence from Quantile Regressions 169-196. [[Crossref](#)]