HUMAN RESOURCE MANAGEMENT AND LABOR PRODUCTIVITY: DOES INDUSTRY MATTER?

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There has been growing interest in the degree to which human resource systems contribute to organizational effectiveness, yet limited research attention has been paid to the contextual conditions that moderate the efficacy of these practices. In this study, we examined how industry characteristics affect the relative importance and value of *high-performance work systems.* Findings indicate that the impact of these human resources systems on productivity is influenced by industry capital intensity, growth, and differentiation.

Although not yet widely incorporated into research paradigms, industry characteristics may have far-reaching implications for HRM. Industries, like national cultures, are the contexts within which meanings are construed, effectiveness is defined, and behaviors are evaluated. (Jackson & Schuler, 1995: 252)

Recent years have witnessed burgeoning interest in the degree to which human resource systems contribute to organizational effectiveness. Pfeffer (1994, 1998), for example, argued that success in today's hypercompetitive markets depends less on advantages associated with economies of scale, technology, patents, and access to capital and more on innovation, speed, and adaptability. Pfeffer further argued that these latter sources of competitive advantage are largely derived from firms' human resources. On the basis of these and similar arguments, Pfeffer (1994, 1998) and others (e.g., Kochan & Osterman, 1994; Lawler, 1992, 1996; Levine,

1995) have strongly advocated greater firm investments in *high-performance* or *high-involvement human resource systems,* which are systems of human resource (HR) practices designed to enhance employees' skills, commitment, and productivity.

We believe these sentiments to be true in the main; however, we also believe that these investments may be more beneficial in some contexts than in others. More specifically, as emphasized in the strategic management and industrial organization literatures (e.g., Porter, 1980), a firm's industry (or industries) is an important part of the milieu within which organizational policies and practices are framed and executed. We believe this to also be true for HR policies and practices. Unfortunately, extant HR research has generally ignored the impact and influence of industry characteristics on the efficacy of HR systems. We sought in this study to fill this important void by examining how industry characteristics moderated the effectiveness of high-performance work systems. Because labor productivity is the key indicator of workforce performance (Delery & Shaw, 2001), we examined the relationship between high-performance work systems and this critical outcome measure.

HISTORICAL ROOTS AND THEORETICAL PERSPECTIVES

Wright and McMahan defined strategic human resource management (SHRM) as "the pattern of planned human resource deployments and activi-

ties intended to enable an organization to achieve its goals" (1992: 298). According to Delery and Shaw (2001), at least two major features distinguish SHRM research from the more traditional HR management (HRM) practice research. First, SHRM studies have focused on explicating the strategic role that HR can play in enhancing organizational effectiveness. A second distinguishing feature is the level of analysis. HRM practice research has traditionally had an individual-level focus; in contrast, SHRM research is typically conducted at the business-unit or organizational level of analysis. Reflecting this orientation, recent HR research has focused on high-performance work systems, a term used to denote a system of HR practices designed to enhance employees' skills, commitment, and productivity in such a way that employees become a source of sustainable competitive advantage (Lawler, 1992, 1996; Levine, 1995; Pfeffer, 1998).

Neither conceptual/prescriptive (e.g., Lawler, 1992; Levine, 1995; Pfeffer, 1998) nor empirical work (e.g., Arthur, 1994; Huselid, 1995) yields a precise definition of a high-performance work system, but these systems include practices such as rigorous selection procedures, internal merit-based promotions, grievance procedures, cross-functional and cross-trained teams, high levels of training, information sharing, participatory mechanisms, group-based rewards, and skill-based pay. A number of studies have revealed links between greater use of these types of practices and labor productivity (e.g., Arthur, 1994; Guthrie, 2001; Huselid, 1995; Ichniowski, Shaw, & Prennushi, 1997; Koch & McGrath, 1996; MacDuffie, 1995).

Guided by contingency theory, our position is that the value of utilizing high-performance work systems will be influenced by a firm's industry context. A number of seminal organizational theorists (e.g., Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967; Woodward, 1965) have discussed the interplay of firms' external environments and their management structures or styles. Burns and Stalker were the first to establish this link, concluding that environments imbued with "changing conditions, which give rise constantly to fresh problems and unforeseen requirements" (1961: 121) were better served by an "organic" management style, as opposed to a "mechanistic" approach. Analogous to a "control-oriented" HR system (cf. Arthur, 1994), a mechanistic management style emphasizes the expertise and authority of members at the top of an organizational pyramid. In contrast, in a firm with an organic management style, knowledge is assumed to be widely dispersed throughout the organization, and broadened task roles and employee commitment to the entire organization are emphasized. Communication patterns tend to be lateral (rather than vertical), emphasizing information exchange consisting of information and counsel. The discussion in the SHRM literature of high-commitment, high-involvement, or high performance HR systems resonates strongly with Burns and Stalker's organic style of management. These management styles or systems are employee-centered by design: It is assumed that optimal organizational performance will be achieved through high employee capability, paired with employee commitment and involvement.

Burns and Stalker also presaged the debate in the SHRM literature regarding whether high-performance work systems' effectiveness is "universal" or "contingent" upon firm context. As contextualists, Burns and Stalker (1961) discussed—and noted their objection to—H.A. Shepard's (1956) proposal that a "new orientation" in management (i.e., organic management styles) would be equally effective in all industries. Thus, discussions of high-performance work systems and debates regarding their universal or contingent effects have deep historical roots.

More recently, the resource-based view of the firm has also incorporated a contingency perspective. In this view, organizational resources can be a source of sustainable competitive advantage to the extent that they create value and allow a firm to excel in its particular competitive environment. As Barney stated, "Firm resources are not valuable in a vacuum, but rather are valuable only when they exploit opportunities and/or neutralize threats" (1995: 52). The notion of "fit" is embedded in the resource-based view: resources contribute more or less value depending on a firm's competitive environment. In the SHRM literature, Batt (2002) invoked resource-based contingency notions in her exploration of the moderating effects of customer segments on the HR-firm performance relationship.

By engendering broad repertoires of skill and behavior, many high-performance work system elements promote organizational flexibility. Broad perspectives and experience sets, coupled with aligned interests, information sharing, and participatory mechanisms, enhance prospects for spontaneity, innovation, and alternative strategy generation throughout an organization (Wright & Snell, 1999). Thus, high-performance work systems seem particularly well suited for competitive environments requiring a dynamic fit. Empirical work to date, however, has not systematically explored the validity of this general proposal. Most SHRM researchers have treated industry as a nuisance variable to be controlled or "partialed out of" their models. As developed below, we believe a set of

industry characteristics prominently featured in the strategy and industrial organization literatures has significant implications for the impact of high-performance work systems on organizational effectiveness.

HYPOTHESES

In developing "discretion theory," Hambrick and colleagues (e.g., Hambrick & Abrahamson, 1995; Hambrick & Finkelstein, 1987), have specified industry characteristics that imbue competitive markets with many of the features described by Burns and Stalker (1961) and Wright and Snell (1999) as requiring an organic HR system. According to these theoretical perspectives, the industry characteristics of capital intensity, market growth, industry differentiation, and industry dynamism should moderate the efficacy of high-performance work systems.[1]

Capital intensity has played a prominent role in the management and economics literatures. Although the labor economics literature indicates that capital-intensive industries are generally associated with increased employee skill levels and higher wages, there are a number of reasons to believe that high-performance work systems will be more beneficial to firms in low-capital-intensity industries. As strategy researchers have noted (Datta & Rajagopalan, 1998; Hambrick & Lei, 1985), capital intensity often creates strategic rigidity because fixed costs are high and deviations tend to be expensive. Firms in high-capital-intensity industries tend to focus on leveraging their investments, resulting in a greater concern for cost and efficiency considerations. Although directed primarily at the impact of organizational leadership on firm performance, the consistent argument in this body of work is that human resource effects decrease in industries with high capital intensity. Similar arguments can be found in the SHRM literature. Terpstra and Rozell, for example, argued that in capital-intensive industries, there are "greater constraints placed upon employee performance by the degree of task structure or the degree of automation of the production technology" (1993: 43). In simple terms, the human element becomes more integral to the production process as capital intensity decreases. As such, a system of HR practices used broadly to endow all employees in a workforce with greater skill and commitment should offer

greater advantages in labor-intensive than in capital-intensive industries. Thus:

Hypothesis 1. Industry capital intensity will moderate the relationship between high-performance work systems and labor productivity, with the relationship being stronger in industries having lower capital intensity.

Arguments can also be made in the context of market growth, an industry characteristic featured prominently in research on organizational theory and strategic management (e.g., Datta & Rajagopalan, 1998). Demand growth has been associated with greater market opportunity and competitive variation, providing managers and employees with more discretionary opportunities. High-growth industries are characterized by entrepreneurial decision making, with greater opportunities for industry initiatives and decision-making freedom. Hambrick and Finkelstein (1987) suggested that industry growth results in expanded options for firms, reducing the tendency toward organization inertia. These industry features are associated with market and organizational variability and enhanced discretion, increasing the relative benefit derived from using an organic HR system in the form of high-performance work systems. Thus:

Hypothesis 2. Industry growth will moderate the relationship between high-performance work systems and labor productivity, with the relationship being stronger in high-growth industries.

As may industry capital intensity and growth, *industry differentiation* should also moderate the relationships between high-performance work systems and firm productivity. In undifferentiated industries, firms tend to have relatively similar, commodity-like products and to attend primarily to cost and efficiency considerations (Porter, 1980). In contrast, in more differentiated industries, competitive success often hinges on products that stand out from competitors' on the basis of product features, quality, design, and so forth. There are also more avenues for competition and a wider range of feasible competitive actions, with means-end linkages being relatively ambiguous (Porter, 1980). Thus, on average, firms in differentiated industries shift production and organizational processes more frequently to meet changing market and customer preferences. Moreover, jobs tend to be more complex and varied, requiring broader skill sets and the ability and willingness to succeed in more challenging and varying circumstances. As such, higher industry differentiation should magnify the value of high-performance practices such as broadly de-

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[1] Hambrick and colleagues also identified extent of industry regulation, but this feature was not applicable to the sample represented in the present study.

fined tasks, decentralized decision making, greater use of teams, cross-utilization, and more training. As such:

Hypothesis 3. Industry product differentiation will moderate the relationship between high-performance work systems and labor productivity, with the relationship being stronger in industries having higher product differentiation.

Finally, industry dynamism has also been postulated to have an important affect on the nature of competition, defining the extent to which a firm faces an environment that is predictable and stable or changing and uncertain. As with industry growth, Hambrick and Finkelstein (1987) suggested that industry dynamism expands firms' options, reducing inertial tendencies. By necessitating frequent strategic and structural adaptations, turbulent environments increase information-processing needs and complexity. In general, skill requirements in more dynamic environments are likely to be more complex and varied, increasing the need for individuals with both the capacity and willingness to deal with complexity and change. Thus, industry dynamism is associated with a greater need for organizations to be capable of achieving dynamic fit through their use of organic HR systems:

Hypothesis 4. Industry dynamism will moderate the relationship between high-performance work systems and labor productivity, with the relationship being stronger in more dynamic industries.

METHODS

Sample and Data Collection

The firms in the sample were selected on the basis of several criteria. First, only publicly traded firms in the manufacturing sector (two-digit SIC code 20–39) having a minimum of 100 employees and $50 million in sales were included. Second, since the influence of industry characteristics can only be meaningfully assessed in nondiversified firms, the sample was limited to firms deriving at least 60 percent of sales revenues from activities classified under a single four-digit SIC code. Third, we included only firms in which we could identify a senior HR executive. Names and addresses for these individuals were obtained from the *Directory of Corporate Affiliations,* the *Hunt-Hanlon Select Guide to HR Executives,* and the *Society for Human Resource Management Membership Directory*. A total of 971 firms met the above criteria.

After pilot testing, surveys were mailed in mid 2000 to the HR executives identified in the sample firms. This mailing was followed by a reminder letter, a second survey, and finally, a telephone reminder. We received a total of 144 responses, representing a 15 percent response rate. However, 12 of the 144 firms providing survey responses were eventually excluded because relevant firm-level data were not available (owing to delistings resulting from acquisitions, mergers, or firms going private); these exclusions left a usable sample of 132 firms. Although somewhat low, our response rate is consistent with those in other survey-based studies of high-performance work systems. Becker and Huselid (1998) reviewed studies having response rates ranging from 6 to 28 percent, with an average of 17.4 percent. To assess the reliability of our HR system measures, once we received a "primary" response, we sent a "secondary" survey to a second HR person in each participating firm. This was an abridged survey, with only the high-performance work systems practice items. While initial respondents were typically senior vice presidents or vice presidents of human resources, the modal title of the second respondents was HR manager. We received multiple responses from 33 firms, two responses from 29 firms, and three responses from 4 firms.[2]

Measures

Labor productivity. While a number of outcome measures (e.g., turnover, absenteeism, profits) have been used to ascertain the effectiveness of HR systems, we focused on labor productivity for a number of reasons. First, labor productivity is a crucial organizational outcome. At a general level, labor productivity, defined as total output divided by labor inputs (Samuelson & Nordhaus, 1989), indicates the extent to which a firm's labor force is efficiently creating output. Second, because connections between human capital and productivity—especially labor productivity—are relatively direct, the face validity of this measure of firm success is also relatively high (Dyer & Reeves,

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[2] Secondary responses were used solely for assessment of reliability. Although it would have been ideal to have secondary responses from all sample firms, we had multiple responses for about 25 percent (n = 33) of our sample firms. As such, it seemed most appropriate to use the primary responses to represent the firms. However, to assess whether the use of primary versus secondary responses altered findings, we conducted supplemental analyses, using an average high-performance work systems index for firms with multiple responses. Results (that is, the significance of the "main effects" and the interaction parameter estimates) were unchanged.

1995). Third, SHRM theorists have identified labor productivity as the crucial indicator of workforce performance (Delery & Shaw, 2001). Finally, productivity has been the most frequently used outcome variable in a large body of work in the SHRM literature (Boselie & Dietz, 2003). Citing Guest's point that "we would expect the impact of HRM to become progressively weaker as other factors intervene" (1997: 269), Boselie and Dietz advocated a focus on productivity as the "bridge in future research between the often labeled soft HRM outcomes (e.g., employee satisfaction, commitment and trust) and hard financial outcomes (e.g., sales, profits, ROI)" (2003: 21). Drawing on prior research (e.g., Guthrie, 2001; Huselid, 1995; Koch & McGrath, 1996), we measured productivity as the logarithm of the ratio of firm sales to number of employees. Data were obtained from COMPUSTAT. This measure is not without limitations. First, it does not control for potential increases in costs (e.g., labor costs) that may accompany increased revenue generation. Second, not all elements of this outcome measure are directly controllable by employees (e.g., market demand, product price). These limitations notwithstanding, this measure of productivity is a key indicator of the efficiency with which firms produce revenue, and it allows comparability across industries and with previous studies.

High-performance work systems. Researchers have used a variety of approaches to measure high-performance work systems. Our measure is based upon the work of Guthrie (2001) and Huselid (1995). We assessed the use of 18 practices, which are identified in the Appendix. Estimates were obtained of the proportion (0–100%) of members of each of two groups, "exempt" and "nonexempt" employees, who were covered by each high-performance work system practice. Using the number of employees in each group, we computed a weighted average for each practice. The mean of these 18 weighted averages represented a firm's high-performance work systems score. Cronbach's alpha for the composite high-performance work system scale was .78.

Scholars (e.g., Gerhart, 1999; Gerhart, Wright, McMahan, & Snell, 2000; Huselid & Becker, 2000) have debated the merits of relying on internal indexes of reliability (such as Cronbach's alpha) to support the reliability of HR system measures. Questions have also been raised about the reliability of measures of HR practices based on single sources of information. Because of these concerns, we used the sample firms with multiple responses ($n = 33$) to compute the intraclass correlation coefficient, ICC(1), as a check of the reliability of our HR data. ICC(1) can be conceptualized as the proportion of variance in a measure explained by group membership (Bryk & Raudenbush, 1992). As Bliese noted, "When ICC(1) is large, a single rating from an individual is likely to provide a relatively reliable rating of the group mean; when ICC(1) is small, multiple ratings are necessary to provide reliable estimates of the group mean" (2000: 356). For the high-performance work system scale, the ICC(1) value was .62, a value that, according to available standards (e.g., Bliese, 2000; Gerhart et al., 2000), is large and supportive of an acceptable degree of agreement across raters.

Industry characteristics. *Industry capital intensity* was the three-year (1997–99) average ratio of fixed assets to sales for firms in each industry defined at the three-digit SIC level (Chang & Singh, 1999). *Industry growth* was defined as the average five-year annual growth rate in value of shipments based on the data available in the *U.S. Census of Manufacturers.* This measure of industry growth has been widely used (Hambrick & Abrahamson, 1995; Rajagopalan & Datta, 1996). The three-year (1997–99) mean of the average ratios of R&D expenditures to total sales for all firms belonging to the sample firms' three-digit SIC industries was used as an indicator of *industry product differentiation* (Hambrick & Finkelstein, 1987). Finally, following Keats and Hitt (1988), we assessed *industry dynamism* using a two-step procedure: first, the natural logarithm of sales for each three-digit industry for the years 1997–99 was regressed against time, and then the antilogarithms of the standard errors from these models were calculated. These antilogarithms represent an index of volatility or dynamism for each industry.

Control variables. In view of prior research, in our analyses we controlled for firm size, firm growth, firm capital intensity, level of employee unionization, and firm strategy. *Firm size* was included as a control because it may be associated with the use of more "sophisticated" human resource practices as well as with higher productivity (Guthrie, 2001; Jackson & Schuler, 1995). Size was the natural logarithm of a firm's number of employees (e.g., Huselid, 1995; Koch & McGrath, 1996). Because of its potential implications for both HR systems and firm productivity (Huselid, 1995), *firm sales growth* was another control variable; we defined it as the growth in a firm's sales over a three-year period (1997–99). As have previous studies (e.g., Huselid, 1995; Koch & McGrath, 1996), to control for possible relationships with use of high-performance work systems and firm productivity, we controlled for *firm capital intensity.* We computed a firm's relative capital intensity as the mean

of firm capital intensity (fixed assets/sales) divided by the capital intensity for a particular firm's industry (Rajagopalan & Datta, 1996). All data for these controls were obtained from COMPUSTAT. In addition, we controlled for *level of unionization* (based on estimates provided by survey respondents) because unions might influence labor productivity (Freeman & Medoff, 1984). Finally, using an instrument developed by Zahra and Covin (1993), we controlled for firms' business-level strategies. This scale used five items (concerning, for example, level of operating efficiency and offering competitive prices) to assess the extent to which a firm pursued a cost leadership strategy ($\alpha = .77$).

ANALYSES AND RESULTS

Table 1 presents the means, standard deviations and zero-order correlations among all study variables. Standard deviations of industry characteristics measures display reasonably high variance in the underlying sample, indicating that the sample does not reflect idiosyncratic industry conditions.[3]

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[3] We checked for possible nonresponse bias using two tests. First, we compared late to early respondents along key study variables (as first suggested by Oppenheim [1966]). The assumption behind this "time trend extrapolation test" (Armstrong & Overton, 1977) is that those providing responses late—after a second mailing and follow-up telephone call—are very similar to nonrespondents, given that they would have fallen into that category had not the second set of questionnaires been mailed. No significant differences between early and late respondents along any of the key study variables (firm productivity, high-performance work system, industry capital intensity, growth, and product differentiation)

Hierarchical ordinary least squares (OLS) regression analyses were used to test Hypotheses 1–4. Table 2 presents these results. Model 1, which included the control and industry characteristics variables, explained nearly 42 percent of the variance in labor productivity. In model 2, we introduced the high-performance work systems measure. Consistently with past research (e.g., Guthrie, 2001; Huselid, 1995; Ichniowski et al, 1997; Koch & McGrath, 1996), results indicated a positive association between more extensive use of high-performance work system practices and workforce productivity ($p < .05$). The introduction of the high-performance work systems variable explained an additional 1.6 percent of the variance in workforce productivity.

Since our hypotheses represent the "fit as moderation" perspective in Venkatraman's (1989) classification scheme, we used moderated regression analysis to test them. To address issues of multicollinearity arising from the interaction terms being highly correlated with their constituent variables (and also to ease interpretation of the regression coefficients), we adopted the procedure suggested by Aiken and West (1991). In this approach, the direct terms used to construct the interaction terms are centered by subtracting the mean of each vari-

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were shown in *t*-tests. Second, we used *t*-tests to compare the means of the four industry characteristics in the respondent and the nonrespondent samples. No differences were detected. Although these tests suggest sample representativeness, we could not ascertain whether respondents and nonrespondents differed on unmeasured variables that also correlate with both our predictor and dependent variables.

TABLE 1
Means and Correlation Coefficients[a]

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10
1. Productivity[b]	5.27	0.55										
2. High-performance work system	49.58	15.27	.11									
3. Industry capital intensity	0.41	0.57	.52	−.12								
4. Industry growth	0.40	0.30	−.08	.05	−.20							
5. Industry differentiation	−0.02	0.78	−.08	.09	−.21	.46						
6. Industry dynamism	1.03	0.16	.04	−.00	−.02	−.00	−.10					
7. Firm size[c]	1.12	1.45	−.11	.15	−.20	−.19	.02	.02				
8. Firm sales growth	0.20	0.56	.18	−.05	−.05	.22	.20	−.02	−.02			
9. Firm unionization	16.37	26.41	−.19	−.13	−.02	−.10	−.13	−.03	.24	.01		
10. Firm relative capital intensity	1.07	0.64	−.05	.07	.01	−.03	−.04	.04	.04	−.23	−.08	
11. Firm strategy	3.54	0.58	.22	.15	.03	−.11	−.06	.11	.20	.04	.01	.02

[a] Correlations greater than .14 are significant at $p < .10$; those greater than .18 are significant at $p < .05$; and those greater than .24 are significant at $p < .01$; all two-tailed tests.
[b] Natural logarithm of revenue (in thousands) per employee.
[c] Natural logarithm of the number of employees (in thousands).

TABLE 2
Results of Regression Analyses: High-Performance Work Systems,
Industry Characteristics, and Labor Productivity[a]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Industry capital intensity	0.50***	0.51***	0.43***	0.49***	0.49***	0.51***
	(0.07)	(0.07)	(0.08)	(0.07)	(0.07)	(0.07)
Industry growth	−0.05	−0.07	−0.06	−0.11	−0.06	−0.06
	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)	(0.16)
Industry differentiation	−0.06	−0.10	−0.19	0.03	−0.34	−0.10
	(0.86)	(0.85)	(0.84)	(0.83)	(0.84)	(0.85)
Industry dynamism	0.07	0.08	0.08	0.09	0.09	0.01
	(0.25)	(0.25)	(0.25)	(0.24)	(0.24)	(0.36)
Firm size	0.00	−0.01	−0.00	0.00	−0.02	−0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Firm sales growth	0.21***	0.21***	0.22***	0.27***	0.26***	0.21***
	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)	(0.08)
Firm unionization	−0.00*	−0.00*	−0.00*	−0.00*	−0.00*	−0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Firm strategy[b]	0.19**	0.17*	0.17*	0.17*	0.17*	0.17*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Firm relative capital intensity	0.01	0.01	0.01	0.05	0.02	0.01
	(0.06)	(0.06)	(0.06)	(0.07)	(0.06)	(0.06)
Intercept	4.62***	4.68***	4.67***	4.59***	4.65***	4.68***
	(0.26)	(0.27)	(0.25)	(0.26)	(0.25)	(0.26)
High-performance work systems		0.01*	0.01*	0.01*	0.01*	0.01
High-performance work systems × industry		(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
High-performance work systems × capital intensity		−0.01*				
		(0.00)				
High-performance work systems × industry growth				0.03*		
				(0.01)		
High-performance work systems × industry differentiation					0.12**	
					(0.05)	
High-performance work systems × industry dynamism						0.03
						(0.28)
Intercept						
R^2	0.42***	.44***	.46***	.46***	.47***	.44***
ΔR^2		.02	.02	.03	.03	.00
F for ΔR^2		2.89*	3.91*	5.35*	5.70**	0.09

[a] Unstandardized coefficients are reported; the figures in parentheses are standard errors. $n = 118$ for all models.
[b] Cost leadership.
* $p < .05$
** $p < .01$
*** $p < .001$
One-tailed tests.

able from observed values. This results in the interaction terms having relatively low correlations with the direct terms. In addition, we assessed whether multicollinearity was a problem by computing the variance inflation factors (VIFs). None of the VIFs approached the threshold value of 10 suggested by Neter, Wasserman, and Kutner (1985).

As indicated in Table 2, the interaction term comprised of high-performance work systems and industry capital intensity (model 3) was significant in the regression model ($p < .05$), suggesting that industry capital intensity moderated the relationship between high-performance work systems and

productivity. Plotting the interaction effects using the approach outlined by Aiken and West (1991) indicated that the relationship between high-performance work systems and productivity strengthens as industry capital intensity diminishes, supporting Hypothesis 1. Similarly, the significance ($p < .05$) of the interaction term involving industry growth and high-performance work systems (model 4) indicated that the relationship between use of a high-performance work system and firm productivity was also moderated by industry growth. Again, a plot of the interaction effects showed that the relationship between the high-performance work

systems scale and productivity is relatively stronger under circumstances of high industry growth, supporting Hypothesis 2.

The significance ($p < .01$) of the regression coefficient associated with the interaction of industry product differentiation and high-performance work systems in model 5 provides support for Hypothesis 3, which states that industry differentiation moderates the relationship between high-performance work systems and productivity. As expected, plotting the interaction showed that the relationship between high-performance work systems and productivity is greater under conditions of high industry differentiation. However, contrary to expectations (Hypothesis 4), no support was found for the moderating effect of industry dynamism. In sum, while results indicate a positive main effect for high-performance work systems, three of the four moderating effects indicate that industry characteristics influence the extent of the relationship between high-performance work systems and productivity.

DISCUSSION AND CONCLUSIONS

Our analysis supports arguments and previous findings suggesting that firm competitiveness can be enhanced by high-performance work systems (Arthur, 1994; Guthrie, 2001; Huselid, 1995; Koch & McGrath, 1996; Kochan & Osterman, 1994; Lawler, 1992, 1996; Levine, 1995; MacDuffie, 1995; Pfeffer, 1998). Using an approach that controls for firm-level differences to investigate industry-level effects, this study makes its primary contribution by illustrating the potential for industry context to moderate the relationship between HR systems and organizational effectiveness.

Two primary perspectives, a *universal* approach and a *contingency* approach, have been used to model the link between HRM and firm effectiveness (Youndt, Snell, Dean, & Lepak, 1996). Those taking the universal approach have posited a generally positive relationship between "best-practice" HRM and firm performance. In contrast, those taking the contingency approach have proposed that the extent (or even the direction) of the effect of HRM on firm performance will depend on a firm's context or environmental conditions. Our results provide some support for both perspectives. In addition to seeing generally positive effects of high-performance work system practices on productivity, we also observed significant contingency effects, with industry characteristics influencing the degree of high-performance HR practices' impact on labor productivity.

Beyond statistical effects, however, the practical significance of results is an important consideration. Following the advice and previous practice of SHRM scholars (e.g., Becker & Gerhart, 1996; Huselid, 1995), we estimated the practical significance of our results by calculating the impact of a one-standard-deviation increase in the use of the high-performance work systems scale on labor productivity. With all other variables held at their means, the main effects model (model 1) estimates that each one-standard-deviation increase in the high-performance work systems scale is associated with a $15,435 increase in sales per employee. This represents a 7.98 percent gain in labor productivity over the mean sales per employee ($193,322). By way of comparison, the equivalent calculations reported in Huselid (1995) and Becker and Huselid (1998) showed productivity (sales/employee) gains of 16 and 4.8 percent, respectively. For the average-sized firm in our sample, this increase in labor productivity would generate an additional $47 million in total revenue.

To illustrate the practical effect of the moderated regression results, we calculated and compared the impact of a one-standard-deviation increase in use of the high-performance work systems scale on labor productivity under different industry conditions. With all other variables set at their means, when capital intensity is low (one standard deviation below the sample mean), the model estimates that each one-standard-deviation increase in the high-performance work systems scale is associated with a $21,620 increase in sales per employee. Given the lower levels of labor productivity in low-capital-intensity industries ($151,636 per employee), this represents a rather substantial (14.3%) gain. In contrast, in high-capital-intensity (one standard deviation above the sample mean) industries, a one-standard-deviation increase in the high-performance work systems scale is associated with a 1 percent gain over the mean sales per employee figure of $244,664. Turning next to industry growth, when industry growth is high (+1 s.d.), each one-standard-deviation increase in the scale is associated with a $39,172 increase in sales per employee, a 20.1 percent increase over the mean sales per employee figure of $189,854. In slow or low growth (−1 s.d.) industries, each one-standard-deviation increase in the high-performance work systems scale is associated with a small ($6,399, or 3.23%) decrease in sales revenue per employee. In high differentiation (+1 s.d.) industries, each one-standard-deviation increase in the scale is associated with a $34,707 increase in sales per employee, representing an 18.2 percent gain over the mean sales per employee figure of $191,205. In industries marked by low (−1 s.d.) product differentiation,

the effect is quite different; each one-standard-deviation increase in the high-performance work systems scale is associated with a small ($3,829 or 1.9%) loss in sales per employee.

Our study also has relevance for discussions of the reliability of single-source measures of human resource management systems (e.g., Gerhart et al., 2000; Huselid & Becker, 2000; Wright, Gardner, Moynihan, Park, Gerhart, & Delery, 2001). The reliability evidence reported in this study is somewhat more positive than results reported in previous work. As discussed earlier, the ICC(1) estimate indicated a reasonable level of consistency across respondents in the 33 firms providing multiple responses. However, several additional comments are warranted.

First, conditions in this sample favored relatively high shared knowledge. Companies were nondiversified and relatively small (the median number of employees was 2,587). Moreover, respondents had significant job and organizational experience. Primary respondents reported an average of 6.4 years of position tenure and 10.1 years of organizational tenure. Secondary respondents had an average of 4.6 years in their current jobs and 9.9 years of firm experience. Also, respondents were in the same geographic location and both were fairly highly placed within the HR managerial hierarchy. Second, while the ICC(1) value indicated fairly good reliability at the system level (that is, the average of each rater's 18 high-performance work systems items), at the level of the individual HR practice item, ICC(1) values were lower and varied considerably across items. Lower reliability at the item versus the scale level is consistent with results reported elsewhere (Wright et al., 2001) and supports arguments suggesting that high-performance HR practices are most appropriately measured at the system level (Becker & Huselid, 1998). Third, while we did not aggregate HR system responses in this study, the calculated ICC(2) value for the 33 firms with multiple respondents was .77, supporting Wright and colleagues' (2001) conclusion that multiple respondents do indeed improve measurement reliability levels.

On the other hand, this study also illustrates the challenge of procuring multiple survey responses from sample firms. Our approach was to solicit a second survey following receipt of an initial survey—a method that resulted in a 25 percent response rate among initial respondents. As such, the overall response rate for multiple-respondent firms was only 3.4 percent (33 of 971). Thus, obtaining a sufficiently high response rate in multi-industry research designs may prove challenging.

Although our study provides interesting insights into the relationships between use of high-performance work practices, industry conditions, and labor productivity, our findings should be interpreted in the context of the limitations inherent in this study. For example, one legitimate concern is the question of simultaneity. We analyzed and discussed data as if the extent of use of a high-performance work system affected firm productivity; it is also possible that firms experiencing higher productivity are better positioned to invest in high-performance practices. Second, the fact that our study was limited to manufacturing firms limits the generalizability of our findings. Future studies should represent attempts to examine similar relationships in the service sector (cf. Batt, 2002). Third, while our study suggests significant productivity gains occur with use of high-performance work systems, especially under specific industry conditions, we were unable to assess the costs associated with the implementation of these systems. It is certainly possible that increases in costs—especially labor costs—may significantly diminish the types of benefits identified above (cf. Cappelli & Neumark, 2001).

In 1961, Burns and Stalker wrote, "The beginning of administrative wisdom is the awareness that there is no one optimal type of management system" (1961: 125). Our study does not unequivocally support a contingency perspective, but it does suggest a role for industry conditions as a moderator of the HR system–firm performance relationship. Much work remains, however, in identifying other conditions that may influence the generally positive impact of high-performance work systems on firm success. We hope this study encourages further work in this regard.

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