Job Classifications and Plant Performance in the Auto Industry

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This study assesses the relationship between plant economic performance and job classifications, using data from a large, unionized, automobile manufacturer. Combining skilled and semi-skilled job classifications leads to small improvements in economic performance, while reductions in the number of assembly job classifications affect neither plant productivity nor product quality. The data also reveal that classification reductions predict plant modernization, although the magnitude of this effect varies with the occupational group.

CONFRONTED WITH DECLINING MARKET SHARE from intensified international competition, American automobile manufacturers in the eighties have sought to enhance managerial flexibility in an effort to increase labor productivity and improve product quality. To this end, management has pushed for and often gained reductions in the number of collectively bargained job classifications in the industry.[1] Such demands, however, challenge the way American unions supply benefits and protections to unionized workers on the shopfloor. Under the traditional U.S. system of job control unionism, unions and management negotiate highly formalized local contracts and a quasi-judicial grievance procedure to adjudicate disputes during the term of those contracts. Workers' earnings are determined by the wages attached to their job classifications.[2] Lifetime income, access to

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[1] A similar strategy has been pursued in many other unionized industries. American executives often have maintained that the absence of work rule restrictions in nonunion plants is a key contributor to their growth and success and have sought to bring unionized shopfloor practices closer to the nonunion pattern. See Foulkes (1980).

[2] For a discussion of job control unionism, see Kochan, Katz, and McKersie (1986), Piore (1986), and Katz (1985).

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better working conditions, employment security during periods of slack work, and protection from arbitrary treatment flow from this system of highly delineated job classifications and the seniority rules regulating vacancy allocations and training opportunities. Although unions closely guard the integrity of job classifications, when confronted with the risk of a massive loss of employment in an environment of excess capacity, they have been willing to make concessions on the number of job classifications.

Despite management's recent success in attaining such reductions, there is little evidence regarding their impact on economic performance. This study assesses the relationship between plant economic performance and job classifications using plant-level data from a large, unionized, automobile manufacturer operating in the United States and Canada. Our results suggest that the recent reductions in job classifications have made only very small improvements in plant performance. Reducing skilled trades job classifications increases labor efficiency and heightens product quality—but not by large amounts in either case. Reductions at the assembly-line level do not lead to similar improvements.

Data and Measures

The data are drawn from 48 plants, including several that engage in the final assembly of vehicles. There are also body fabrication, engine and transmission assembly, and a few auto parts plants in the data set. The data are plant-level observations for the years 1979 and 1986 (see Katz, Kochan, and Keefe [1987] for details). These years span the period when a sharp decline in the competitive standing of American auto producers spurred extensive changes in the industry's industrial relations. We chose 1979 as our initial observation of plant activity since this was the last year before this and other American auto companies faced a sharp deterioration in sales, a decline which lasted until 1983.

In 1979, there were separate national collective bargaining agreements for Canada and the U.S. negotiated between each auto company and the UAW. In 1986, the Canadian plants were covered by an agreement between each company and the National Automobile, Aerospace, and Agricultural Implement Workers of Canada (CAW). The plants in the U.S. continued to be covered by UAW agreements. In both 1979 and 1986, each plant also had a separate agreement with its respective union local. Job classifications and job descriptions were included in these local agreements.

Measures. Our measure of the number of job classifications in each plant comes from a written survey filled out by the chief industrial relations managers in each plant. We measure the total number of shopfloor job classifications (Total) and the number of job classifications for each of the three major occupational groups that make up the plant work force: (1) skilled trades (Skilled), (2) material handlers, unskilled maintenance, inspectors, and other nonproduction and nonskilled-trades jobs (Semi-skilled), and (3) production and assembly-line jobs (Assembly).

The survey also obtained information on the number of first-level supervisors and the number of workers in each plant. We use these figures to calculate the ratio of first-line supervisors to workers in each plant and then use this ratio as one indicator of plant economic performance. We expect that more efficient plants have fewer supervisors per production worker.

From corporate headquarters, we obtained several additional measures of plant performance for each plant.[3] We use an annual plant average of a corporate quality index (Quality) scored from a count of the number of demerits that appear in quality audits of each plant's products.

The company keeps track of the hours of direct labor used to produce each vehicle in each assembly plant. Using industrial engineering standards to adjust for product complexity, the company generates a labor productivity index (Adjusted Labor Hours) for each assembly plant by dividing actual production worker hours per vehicle by the standard number of hours each plant is expected to use to assemble the mix of vehicles it produces.

We measure the extent of technological plant modernization (Modernize) from responses to a five-point-categorical variable (ranging from no modernization to a completely new facility) included in the survey. We use Modernize as a dependent variable to test the extent to which modernization occurs in plants where there are relatively greater reductions in the number of job classifications.

To control for product heterogeneity, our regressions include the dummy variables Assembly Plant and Body Plant. There are several newly constructed plants and retrofitted plants in our sample that we control for with the dummy variable Start-up. There may well be other plant and work force characteristics that affect plant economic performance, such as work force skills and the tenor of labor-management relations in the plant. The lack of consistent measures across plants limits our analysis of these factors.

Statistical Analysis

We used the following equation to test our hypotheses:

$$X_{i,t} = K + \alpha_1 \text{Skilled}_{i,t} + \alpha_2 \text{Assembly}_{i,t} + \alpha_3 \text{Semi-skilled}_{i,t} + \alpha_4 \text{Assembly Plant}_{i,t} + \alpha_5 \text{Body Plant}_{i,t} + \alpha_6 \text{Start-up}_{i,t} + e_{i,t}$$

[3] For proprietary reasons, financial plant performance measures were not available.

TABLE 1

JOB CLASSIFICATIONS AND PLANT PRODUCT QUALITY
(STANDARD ERRORS IN PARENTHESES)

	Equations				
	(1) Quality	(2) Quality	(3) Quality	(4) Quality	(5) Quality
Total	—	−0.014*	—	—	—
		(0.007)			
Skilled	0.002	—	0.062*	—	—
	(0.045)		(0.033)		
Assembly	0.013	—	—	−0.012	—
	(0.014)			(0.011)	
Semi-skilled	0.105**	—	—	—	−0.080***
	(0.048)				(0.029)
Assembly Plant	−9.841***	−9.880***	−10.458***	−9.316***	−9.990***
	(1.705)	(1.584)	(1.715)	(1.559)	(1.506)
Body Plant	−2.921	−4.219**	−3.635*	−3.949*	−3.651*
	(2.042)	(1.996)	(1.928)	(2.064)	(1.867)
Start-up	−5.759***	−4.978**	−4.596**	4.467**	−5.771***
	(1.965)	(1.963)	(1.914)	(1.965)	(1.946)
Intercept	140.631***	139.541***	139.784***	138.132***	140.803***
	(2.050)	(1.920)	(2.023)	(1.700)	(1.878)
Observations	79	79	79	79	79
F	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.429	0.406	0.406	0.390	0.437

* Statistically significant at the 10 per cent level; ** statistically significant at the 5 per cent level; *** statistically significant at the 1 per cent level.

The model that underlies this equation is presented in Katz, Kochan, and Keefe (1987) and in Kochan, Katz, and McKersie (1986).

In equations 1 through 9 (see Tables 1 and 2), X is a measure of plant i's economic performance in year t (1979 or 1986). X is measured by the quality index, efficiency index, or the ratio of first-line supervisors to workers in each plant. K is an intercept and $e_{i,t}$ is an error term. The data are a pooled sample across plants and years. Missing observations of certain variables reduced the sample size in some of the equations.

In equation 10, X is the variable Modernize, measuring the degree of technological modernization that occurred in plant i between 1979 and 1986. In this equation, the independent variables are the differences in the value of each variable in 1986 and in 1979.

Results

Equations (1) to (5) in Table 1 report regressions with Quality as the dependent variable. The equations use various measures of the number of job classifications in each plant. Equations (1) and (5) indicate that a decrease in the number of semi-skilled job classifications is associated with a statistically significant increase in the quality index.[4] During this period, the average plant reduced the number of these classifications by 7.5. Multiplying the regression coefficients by the average number of reductions in semi-skilled job classifications, we arrive at an estimate that these reductions led to an increase in the quality index in the range of 1/2 to 3/4 points, which is less than a 1 per cent improvement.

The independent variable Skilled is used to explain variations in plant product quality in equation (3).[5] The sign of the estimated coefficient indicates that a decrease in the number of skilled trades job classifications leads to an increase in product quality. The average plant reduced skilled trades classifications by 4.5 between 1979 and 1986. Our estimation predicts that this led to a 1/4 point improvement in the quality index.

The number of assembly job classifications in equations (1) and (4) has no statistically significant effect on product quality. This is a striking result, given management's emphasis on reducing these classifications.

Equation (2) reports the influence of the total number of classifications on quality: decreasing the total by one job classification leads to a .01 increase in the quality index. The average plant reduced the total number of job classifications by 36 during this period. Using the coefficient estimated in equation (2) yields the prediction that these reductions led to a 1/3 point improvement in the quality index. This is an extremely small effect—less than a 1 per cent improvement.

To explore the relationship between labor productivity and job classifications, we use the dependent variable Adjusted Labor Hours in equation (6) (see Table 2). This equation is estimated only for the assembly plants, as only these reported adjusted labor hours. The estimated coefficient for assembly classifications in equation (6) indicates that a decrease in the number of these job classifications is associated with an *increase* in adjusted labor hours, i.e., a decline in productivity. In contrast, a decrease in semi-skilled job classifications leads to a decline in adjusted labor hours. Although

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[4] Equations 1–9 are estimated using weighted least squares with the number of workers in the plant as the weight to account for differences in the importance of plants.

[5] These models, particularly the combined model in equation (1), are plagued by multicollinearity. We used several methods to reduce the collinearity problem, including the extraction of the means from the independent variables.

TABLE 2

JOB CLASSIFICATIONS AND PLANT LABOR PRODUCTIVITY, SUPERVISORS, AND MODERNIZATION (STANDARD ERRORS IN PARENTHESES)

	Equations				
	(6) Labor productivity	(7) Supervisors	(8) Supervisors	(9) Supervisors	(10) Modernize
Total	—	0.002*** (0.001)	—	—	—
Skilled	−0.369 (0.892)	—	0.017*** (0.004)	0.013*** (0.002)	−0.110* (0.057)
Assembly	−0.282** (0.121)	—	−0.001 (0.001)	—	−0.015 (0.014)
Semi-skilled	0.630** (0.285)	—	0.006 (0.005)	—	0.116*** (0.043)
Assembly Plant	—	0.095 (0.139)	0.256* (0.131)	0.234* (0.131)	—
Body Plant	—	0.628*** (0.171)	0.549*** (0.159)	0.591*** (0.151)	—
Start-up	27.389*** (7.160)	−0.414* (0.228)	−0.436** (0.210)	−0.356* (0.206)	—
Intercept	115.138*** (10.318)	−2.952*** (0.162)	−3.122*** (0.159)	−3.217*** (0.150)	—
Observations	32	96	96	96	48
F	0.0008	0.0001	0.0001	0.0001	0.0004
Adjusted R^2	0.408	0.200	0.342	0.333	0.287

* Statistically significant at the 10 per cent level; ** statistically significant at the 5 per cent level; *** statistically significant at the 1 per cent level.

both of these results are statistically significant, they should be analyzed with caution given the small sample size.

One of the frequent criticisms of American management is that there are too many managers, including supervisors, relative to production workers, especially when compared to Japanese companies.[6] Equations (7), (8), and (9) assess the relationship between the ratio of supervisors to workers and the number of job classifications.[7] Equation (7) indicates that a decrease in the *total* number of job classifications is associated with a decrease in the

[6] During the sample period, the average ratio of supervisors to workers did not change. In specific cases, however, there have been substantial changes. Some plants have dramatically reduced the ratio of supervisors to workers, while others have experienced an increase.

[7] Equations 7–9 are estimated with a logit specification for grouped data (and weighted least squares) because the dependent variable is restricted between 0 and 1.

ratio of supervisors to workers. The coefficients on the number of skilled trades classifications in equations (8) and (9) suggest that a decrease in the number of these classifications is associated with a decrease in the ratio of supervisors to workers.[8] These coefficients are statistically significant at the 1 per cent level. Equation (8) also indicates no statistically significant relationship between the number of assembly-line job classifications and the ratio of supervisors to workers. Here, as with the quality and adjusted labor hours equations, we observe measurable effects from reductions in skilled and semi-skilled job classifications, while changes in assembly job classifications show no impact.

Excess domestic auto manufacturing capacity has existed throughout the eighties. This environment allows automobile company executives to be selective in choosing where to make investments in new technology. Some local trade union officials complain that they have been whipsawed into making local concessions on work rules under the threat of a plant shutdown or an alternate siting of a new car line. Equation (10) explores the relationship between job classifications and modernization, using a first difference equation to subtract out any constant plant-specific events. The results suggest that reducing the number of skilled and semi-skilled job classifications leads to an increase in the degree of modernization, while the number of assembly classifications has no effect on modernization. Thus, modernization between 1979 and 1986 was more extensive where skilled or semi-skilled job classifications were reduced.

Discussion

Our results suggest that in this automobile company, combining job classifications led to small improvements in quality and slight reductions in the ratio of supervisors to workers. Moreover, the effects of classification reductions depend on the occupational group. The data suggest that reducing skilled trades job classifications is associated with improved product quality and increased labor productivity; however, these reductions had no significant influence on the ratio of supervisory personnel to the work force.

The most striking results concern the effects of reductions in the number of assembly job classifications. These reductions improved neither productivity nor product quality. In fact, we found higher labor productivity in plants that had more assembly job classifications.

We also found that classification reductions predict plant modernization,

[8] Ideally, we need data on the number of skilled trades supervisors to investigate whether reductions in these classifications lead to reductions in supervisors.

but the effect depends on the occupation. Reductions in semi-skilled and skilled trades are associated in a statistically significant manner with technological modernization, but there is no modernization effect from reductions in assembly classifications.

How can we explain these diverse effects? Reductions in job classifications without accompanying changes in the work process may not yield significant benefits. This may be particularly true for assembly work. Short-cycle-repetitive tasks, which form the basis of assembly-line jobs, may not be amenable to job classification combinations that would enhance productivity or product quality. Improving the productivity of workers in these jobs may require more fundamental changes in the nature of the work process. Increasing managerial discretion over these workers also may generate worker resistance, producing lower productivity and poorer product quality.[9] The skilled trades represent jobs where there is a relatively high degree of task discretion; classification consolidation may eliminate excessive idle time in these jobs.

Because our data come from the plants of only one company, our ability to draw broad conclusions is limited. Still, the data from this company indicate that without a more fundamental restructuring of assembly and production work, efforts to combine the job classifications of these workers do not produce favorable outcomes. An important task for future research is collection of similar data from other companies and industries to help determine if this is true in other settings as well.

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[9] This is particularly likely when combining job classifications leads to an increase in the number of repetitive tasks each assembly line worker must perform. Sometimes these combinations are referred to mistakenly as job enlargement: on the shopfloor they are called speed-up and usually are resisted. Job control unionism arose partly to combat abuses of supervisory discretion; reductions in the number of job classifications may increase such abuse and lead to disruptive shopfloor conflict. See Jacoby (1985) for a discussion of the "drive system" and the abuses of supervisory discretion.