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THE EFFECTS OF REGULATION ON EXECUTIVE COMPENSATION

Thomas M. Carroll and David H. Ciscel*

Recent economic literature has given a great deal of attention to the behavior of the firm under a regulatory constraint. Such efforts include theoretical extensions of the classic article by Averich and Johnson (1962) by Kennedy (1977), as well as empirical tests of the over-capitalization hypothesis by Leland (1974), Smithson (1978) and Spann (1974). In addition, there have been notable attempts to provide a general theory of regulation by Stigler (1971) and Peltzman (1976). Against this background, surprisingly little attention has been paid to the effect of regulation on the compensation of chief executive officers. The effect of regulation on executive rewards strikes at the heart of why regulated firms appear to behave differently than their less regulated counterparts.

The only explicit attempts to relate executive compensation to the presence of regulation appear to be the work of Smyth, Boyes and Peseau (1975) and Ciscel (1977). The apparent oversight of this issue is perhaps best explained by the persistence of the controversy over the nature of the objective function of corporate decision makers introduced as the "sales maximization" hypothesis by Baumol (1967). For the last two decades, the debate over whether corporate decision makers maximize sales or maximize profits has been couched in "either-or" terms. Proponents of each side of the debate, like Smyth, Boyes and Peseau (1975) and Ciscel (1974) on the managerialist side, and Lewellen and Huntsman (1970) and Masson (1971) on the neoclassical side, have produced evidence for their respective positions. Ciscel and Carroll (1980) provide an econometric resolution of the conflict, pointing out the compatibility of the data with both hypotheses, given a proper specification of the compensation-performance equations.

Consideration of the impact of regulation on executive rewards has significance for understanding the different rewards in the regulated sectors and it illuminates the implicit incentives for executive behavior in regulated and unregulated firms. Maximum profits or optimal sales can never be directly observed. All that can be measured is whether or not the pattern of executive compensation is consistent with such maximization objectives. This aspect of economic analysis is particularly important when gauging the effect of regulation on executive pay. The impact of the absence of regulation on compensation can be contrasted to two alternatives: regulation establishes maximum prices as is the case in utilities, while regulation prescribed minimum prices as was the case in the transportation sector (see Jordan, 1972). Executive compensation reflects not only incentive changes brought about by the existence of regulation, but also the form regulation takes.

The Evidence

The data base for this study consists of 287 large corporations. These were selected from the *Fortune* list and the data came from the annual directories of both *Forbes* and *Fortune*. The sample of companies is composed of 221 industrial corporations which do not face administrative regulation of prices, 45 utilities which face maximum rate rules, and 21 transportation companies, which faced various forms of minimum price controls during the period investigated (1970–1976).

The breakdown of the executive compensation variable—measured by the salary plus bonus of the chief executive officer—is presented in table 1. The mean value of executive compensation for utilities is consistently less than the compensation variable for unregulated firms and for transportation firms. Transportation is also associated with a lower mean executive compensation than nonregulated firms. However, the transportation group is considerably more heterogeneous, representing airlines, railroads and trucking firms, than the utility group.

An initial step is required to distinguish between the reward for sales and profits since sales also reflect one component of the reward for profit. The return for technical or cost efficiency can be identified by regressing profit, P_{it} (net income after taxes), against sales, S_{it} (net revenue). Utilities and transportation companies were identified by their respective dummy variables, UD and TD. Although slope dummies for the regulated sectors were also tried, they were not significant in any year.

$$P(S) = a_0 + a_{1t}(S)_t + a_{2t}(TD) + a_{3t}(UD). \qquad (1)$$

The results of this regression are reported in table 2. As expected, sales revenue is a powerful determinant of profit; the sales coefficient is statistically significant at the 1% level in each of the six years tested, and in each case the expected positive sign is encountered. In

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TABLE 1.—MEAN EXECUTIVE COMPENSATION BY INDUSTRY GROUP: 1970–1976 (IN DOLLARS)

Year	All Firms	Utilities	Transportation	Unregulated
1970	194,275.81 (5075.25)	132,425.09 (7313.67)	147,987.00 (7680.83)	211,653.98 (5838.88)
1971	207,613.39 (5448.72)	139,999.67 (7301.04)	151,210.05 (11029.01)	227,339.30 (6280.75)
1973	271,595.84 (7139.63)	163,113.17 (8742.20)	189,910.70 (17165.78)	301,704.50 (7904.42)
1974	294,283.88 (6807.94)	169,866.15 (8630.30)	246,169.65 (20245.94)	325,613.43 (7216.31)
1975	308,443.54 (7759.70)	182,738.73 (9846.54)	238,251.95 (20834.95)	340,709.33 (8512.37)
1976	357,624.08 (9204.46)	197,296.56 (10150.66)	281,977.48 (26976.39)	397,821.87 (9939.89)

Note: Standard errors are in parentheses.

five of the six years the intercept term is negative. The insignificance of the transportation dummy, TD_t, indicates that transportation firms are not materially different from unregulated manufacturing firms. The utility dummy, UD_t, is significant at the 1% level in all six years. The utility dummy results in a positive intercept coefficient for utilities, reflecting the "cost-plus" nature of rate regulation for utilities.

The profit equation allows the development of a residual profit variable, $\hat{P}_{it}$, that measures the level of net profits that cannot be attributed to sales. $\hat{P}_{it}$ has been interpreted as the income associated with technical efficiency adjusted for differences in regulated and unregulated firms.[1]

$$\hat{P}_{it} = P_{it} - P(S). \tag{2}$$

[1] For a detailed explanation of the methodological importance of $\hat{P}_{it}$, see Ciscel and Carroll (1980).

There are two approaches which can be taken in accounting for the impact of regulation on executive incentives. First, one can identify whether the values of coefficients for sales or residual profit differ between one type of firm and the other. Second, one can determine whether the explanatory variables differ in their statistical significance. The first approach is presented in table 3. The compensation of the executive, EC_{it}, was regressed against sales (S_{it}) and residual profit ($\hat{P}_{it}$); regulated firms were distinguished by both intercept dummies and slope dummies.

$$EC_{it} = b_{0t} + b_{1t}S_{it} + b_{2t}\hat{P}_{it} + b_{3t}TD + b_{4t}UD + b_{5t}(TD)S_{it} + b_{6t}(UD)S_{it} + b_{7t}(TD)\hat{P}_{it} + b_{8t}(UD)\hat{P}_{it}, \tag{3}$$

where

EC_{it} = salary plus bonus of the chief executive officer of firm i in year t

TABLE 2.—RELATIONSHIP BETWEEN PROFIT (P) AND SALES (S)
$P(S) = a_{0t} + a_{1t}(S)_t + a_{2t}(TD)_t + a_{3t}(UD)_t$ (1)

Year	a_0	a_1	a_2	a_3	R^2	n
1970	−28,688	.0684[b] (547.9)	−14,929 (.305)	77,680.8[b] (19.624)	.6758	272
1971	−41,548	.0747[b] (957.9)	−41,045.9[a] (2.505)	88,912.2[b] (25.37)	.7816	278
1973	−41,350	.0784[b] (1147.6)	−7,032 (.0473)	99,714.9[b] (19.65)	.8051	285
1974	−32,915	.0671[b] (763.8)	−2,509.4 (.0045)	102,207.3[b] (13.46)	.7325	287
1975	−29,318	.0568[b] (609.7)	−18,320 (.227)	119,914[b] (18.93)	.6877	287
1976	+35,586	.0674[b] (1042.1)	10,155.5 (.0655)	128,705[b] (20.48)	.7889	286

Note: $P(S)$: after-tax profit, explained by sales (in \$1000's)
S: sales revenue (in \$1000's)
TD: transportation dummy; = 1 for transportation firms, 0 for all others
UD: utility dummy; = 1 for utility firms, 0 for all others.
F values are in parentheses.
[a] Statistically significant at the 5% level.
[b] Statistically significant at the 1% level.

Table 3.—Executive Compensation and Regulation: Complete Equation

$EC_{it} = b_{0t} + b_{1t}S_{it} + b_{2t}\hat{P}_{it} + b_{3t}TD + b_{4t}UD + b_{5t}(TD)S_{it} + b_{6t}(UD)S_{it} + b_{7t}(TD)\hat{P}_{it} + b_{8t}(UD)\hat{P}_{it}$

Year	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8	R^2	n
1970	183,668.3[b] (825.1)	.0154[b] (48.67)	.0679 (1.638)	−82,422.8[b] (2.560)	99,641.1[b] (11.99)	.0471 (.5857)	.0229 (1.618)	.4032 (.7988)	−.4217[a] (2.475)	.8926	272
1971	210,357.4[b] (998.6)	.0088[b] (18.72)	.0309 (.2845)	−111,499.0[b] (4.325)	−98,052.4[b] (22.78)	.0482 (.7875)	.0182 (1.455)	.2307 (1.867) $Q(F)$ = .065	−.3431 (1.0931)	.8789	278
1973	264,522.1[b] (1206.8)	.0153[b] (75.71)	−.0135 (.0787)	−168,393.1[b] (7.639)	−150,855.7[b] (41.52)	.0713 (1.855)	.0231[b] (2.915)	.8629[b] (6.405)	−.6055[b] (4.705)	.9040	286
1974	291,105.9[b] (1706.7)	.0110[b] (75.75)	.1652[b] (20.71)	−58,555.1[b] (9.488)	−160,986.8[b] (52.27)	[c]	.0149 (1.810) $Q(F)$ = .0587	.4713[b] (5.157)	−.4597[b] (5.550)	.9280	287
1975	304,406.2[b] (1288.0)	.0112[b] (58.09)	.1595[b] (11.59)	−81,045.4[b] (11.41)	−194,941.6[b] (27.00)	[c]	.0203[b] (2.597)	.5445[b] (4.968)	−.7233[b] (4.545)	.9058	287
1976	346,227.8[b] (1335.49)	.0136[b] (91.76)	.0045 (.694)	−83,854.2[b] (9.631)	−217,824.6[b] (32.83)	[c]	.0205 (2.557)	.1091[b] (6.966)	−.0489[b] (2.694)	.9114	286

Note: F-values are in parentheses.
[a] Significant at the 5% level of confidence.
[b] Significant at the 1% level of confidence.
[c] F-value below critical level of 0.0001; computer omitted variable from equation.

S_{it} = sales revenue (in \$1000's) of firm i in year t

$\hat{P}_{it}$ = residual profit: $P_{it} - (a_0 + a_1S_{it} + a_2(TD) + a_3(UD))_t$

TD = transportation dummy

UD = utility dummy.

As reported in Ciscel and Carroll (1980), the intercept term can be interpreted as the market or base pay of a chief executive officer. The estimated value of b_0 picks up 86.7% to 92.5% of the magnitude of executive compensation for unregulated firms.[2] The return for higher sales or higher residual profit accounts for a small portion of the total executive remuneration.

The estimated coefficients for the intercept dummies, b_3 and b_4, measure the impact of regulation on the base pay of executives of regulated firms. In all years, both intercept dummies are associated with negative coefficients which are significant at the 1% level. If b_0 is interpreted as the market-determined salary base for executives of unregulated corporations, the $(b_0 + b_4)$ is the corresponding minimum salary for utility executives. Utility executives' base salary is reduced by an average of 57% (ranging from 47% to 64%), while the average reduction in the base salary for transportation executives is 38.7% with a range of 24% to 64%.

When a regulatory commission, rather than the seller or the market place, sets the output price, the decision maker for a regulated firm will bear less responsibility for the firm's performance. A risk averse chief executive would be willing to forgo a portion of the salary that could be earned at the helm of a nonregulated firm in return for a less risky business environment. On the demand side, the stability of the regulatory environment would allow corporate directors to seek a less innovative, and less expensive, executive.

The coefficient of the sales variable (b_1) is positive and statistically significant at the 1% level in all years. The impact of sales on executive pay has a dual interpretation, as a direct reward for increasing firm size and as a reward for increasing profit. The general lack of significance of coefficients of the slope dummies, b_5 and b_6, means that regulation does not change the relation between executive pay and sales.

The coefficients on residual profit, b_7 and b_8, most clearly demonstrate the impact of price regulation on executive pay and executive incentives. For the group as a whole, the residual profit variable is statistically significant in only two years (1974 and 1975), although for unregulated firms the insignificance of this coefficient can be attributed to heteroscedasticity (Ciscel and Carroll, 1980). By analyzing the

[2] Regressing the natural log of b_{0t} on mean executive compensation $\overline{EC}$ (from table 1) yielded the equation $b_{0t} = 1.23 (\overline{EC}_t)^{.974}$, with $r^2 = .991$ and a t-value of 20.6.

coefficients for the slope dummies, it appears that transportation executives have a stronger incentive to increase profits by operating efficiently, while the executives for utilities are actually punished for reducing costs.

In all years the slope coefficient for residual profit (b_8) for utilities is negative and is statistically significant in five of the six years. This indicates a negative return to executives for technical efficiency. Rate schedules for utilities have been set in a regulated environment that requires provision of service in return for payments to the firm on the basis of coverage of all costs plus a fair rate of return on investment. Given an inelastic demand for the regulated service, revenues will rise with costs since rate increases can usually be cost justified. Like nonregulated firms, the pay of the chief executive of a utility is a positive function of the firm's revenue. But since revenue increases are closely tied to cost increases, utilities which appear to have the lowest cost effectiveness also tend to have the highly paid executives.

An interesting contrast is provided by positive coefficient for the slope dummy (b_7) for transportation firms. Since transportation firms generally faced minimum rate regulations during the period covered by the data, transportation executives confronted the classic cartel dilemma; while the market demand for the industry's product (e.g., air or rail transportation) may be relatively price inelastic, each firm faced a highly elastic demand, *ceteris paribus*. If the prohibition against price cutting is effectively enforced through regulation, the executive's only option for increasing profit might be cutting costs. In four years (1973–1976), the slope dummy for residual profit is significant at the 1% level, with a positive coefficient (b_7). Peltzman (1976) found this industry to be among the most risky; we find that setting a minimum price regulation may increase management's cost consciousness.

Separation of Transportation and Utilities

Dummy variables, employed by themselves (intercept dummies) or in conjunction with continuous independent variables (slope dummies), are useful in determining if differences exist in the magnitude of coefficients. The use of dummy variables has the advantage of preserving degrees of freedom over the use of separate regressions for identifying differences in the magnitude of coefficients. However, using separate regressions has the advantage of identifying stronger associations between the dependent variable and the independent variable.

Table 4 reports the results of separate regressions fit just to the data for utility and transportation companies.[3] For utilities we find that the coefficient on sales is positive and significant in all years, while the coefficient on residual profit is negative and significant in all years. The results for transportation firms provide a sharp contrast to those of utilities. Between 1970 and 1973, the intercept term for transportation is approximately the same as that for utilities. Both sales and residual profit are significant, with coefficients of roughly the same magnitude as those found for unregulated firms after correcting for heteroscedasticity.[4] Beginning in 1973, the magnitude of the residual profit coefficient for transportation firms essentially doubles in relation to its 1970–1971 value. In 1974–1976, the sales variable ceases to be significant, while the magnitude of the intercept term approaches that of the unregulated firms. The residual profit coefficient completely displaces the sales coefficient in relative importance.

Not only are regulated firms associated with coefficients of different orders of magnitude, but fitting separate regressions for regulated firms reveals a difference in the significance of explanatory variables. For utilities, the combined effect of sales and residual profit appears much stronger than for all firms or unregulated firms. Not only is the residual profit variable significant in all years, but the negative sign on this variable reflects the perverse incentives against cost containment. Transportation firms are dominated by the highly significant and positive coefficient on the residual profit variable.[5]

Conclusions

Regulation has an effect on the rewards received by a firm's chief executive and on the pattern of those rewards. The differences are traceable to the types of regulation and to the levels of risk faced by different sectors. The consistency of the results, both on a year-to-year basis and with separate regulated and un-

[3] Because of the need to determine the significance of the constant term in table 3, a different regression package was used to estimate the models in table 3 (BMDP) and table 4 (SPSS), resulting in slight differences in coefficients between the two tables.

[4] See Ciscel and Carroll (1980) for corrections, table 3.

[5] Similar to the results reported by Lewellen and Huntsman (1970), the authors found heteroscedasticity to be a factor in the significance levels of sales and (residual) profit for nonregulated firms. Unlike Lewellen and Huntsman, correction for heteroscedasticity did not cause the sales variable to become insignificant. By dividing EC_{it}, S_{it} and P_{it} by the square root of book value assets, $(A_{it})^{1/2}$, both sales and residual profit were found to be significant determinants of (corrected) executive compensation. The addition of regulated firms to the data base appears to eradicate the problem of heteroscedasticity. This result seems to stem from the fact that utilities tend to have high asset (book) values and relatively low executive compensation, while transportation firms, also associated with relatively lower levels of executive compensation tend to have lower asset (book) values. Details of the specification of the equations and the Park test for heteroscedasticity are available from the authors upon request.

TABLE 4.—DETERMINANTS OF EXECUTIVE COMPENSATION: REGULATED FIRMS
$EC_{it} = c_{0t} + c_{1t}S_{it} + c_{2t}\hat{P}_{it}$

Year	c_0 (intercept)	c_1 (sales)	c_2	R^2	n
		Part 1: Utilities			
1970	99,653.60	.0356[a] (18.73)	−.0535[a] (6.815)	.5510	45
1971	112,310.80	.0270[a] (19.49)	−.3120[a] (5.581)	.5730	45
1973	113,669.50	.0383[a] (46.72)	−.6290[a] (29.03)	.5846	45
1974	130,137.71	.0250[a] (24.80)	−.2945[a] (10.19)	.5222	45
1975	113,794.00	.0391[a] (32.75)	−.5639[a] (18.14)	.6301	45
1976	96,754.60	.0312[a] (37.35)	−.4445[a] (18.54)	.6477	45
		Part 2: Transportation Firms			
1970	99,707.06	.0660[a] (7.749)	.4711[a] (7.988)	.4001	17
1971	98,847.10	.0571[a] (4.869)	.2616[a] (12.01)	.4288	17
1973	102,104.38	.0875[a] (7.205)	.8494[a] (16.69)	.4955	17
1974	233,588.03	.0139 (.1577)	.6393[a] (6.724)	.3024	21
1975	233,588.03	.0163 (.2086)	.7134[a] (9.501)	.4485	21
1976	330,388.44	.0223 (.3552)	1.1403[a] (7.775)	.3169	21

Note: F-values are in parentheses.
[a] Significant at the 1% level.

regulated equations, provides a basis for the belief that these findings are not ephemeral.

There were three parts to the findings. First, regulation substantially reduces the basic yearly remuneration (supply price) of the chief executive in the regulated sectors of the economy. The reduction of financial risk, the narrowing of the range of executive discretion, plus subjecting executive salaries to governmental review may all explain the lower salaries in transportation and utilities.

Second, the sales variable is consistently significant as an explanatory variable of the level of executive remuneration and is estimated to be of the same order of magnitude every year. Transportation and utility companies do not reward sales performance differently from the sample of industrial companies.

Finally, the residual profits variable, a measure of technical efficiency, provides the most meaningful findings. For the entire sample of corporations, the residual profits variable was significant in only two of six years. However, the dummy slope variables for transportation and utilities provide clarification of the regulatory impact on executive rewards. Price regulation as existed in transportation forced a cost consciousness that is reflected in the chief executive's salary. Cost-plus regulation of utility corporations results in a reduction in compensation for the cost conscious chief executive.

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