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Are CEOS PAID THEIR MARGINAL PRODUCT?
AN EMPIRICAL ANALYSIS OF EXECUTIVE COMPENSATION AND
CORPORATE PERFORMANCE.

By Mark A. Klinedinst[*]

ABSTRACT: The theory and reality of chief executive
compensation is explored in this paper. The study here uses
a panel of data on 143 executives from America's largest
corporations. The results suggest that earlier theoretical
expectations and empirical findings of compressed wage
scales may not hold when top-level managers are included.

According to several studies, the 1980's saw the income distribution of the United States grow more unequal (see Littman 1989). The group at the top of the earned income distribution are the chief executive officers (CEOs) of America's largest corporations. Are these men[i] paid according to their contribution to corporate profitability, or have they become part of an entrenched technocracy that keeps a sharp look at their own interests first and corporate viability second?

Over fifty years ago Adolf Berle and Gardiner Means wrote in <u>The Modern Corporation and Private Property</u> that "we are dealing not only with distinct but often opposing groups, ownership on the one side, control on the other--a control which tends to move further and further away from ownership and ultimately to lie in the hands of management itself, a management capable of perpetuating its own position" (1932, p. 124). This hypothesis has been investigated by a number of more recent authors who have described what seems to be a growing division between ownership and control in American corporations (see Marris 1963, Williamson 1963, Manne 1965, Galbraith 1967, Masson 1971, Edwards 1977, and Crain, Deaton and Tollison 1977). No longer does the owner-entrepreneur command the heights of most large American corporations. Typically, the high-ground of large corporations is occupied by the CEOs, men who command a large network of vice presidents, engineers, and thousands of others by virtue of being successful as organization men.

This hypothesis of separate interests of the top managers and owners will be explored in this paper by looking at the pay of CEO's versus their performance for the stockholders. If this separation has indeed reached a point where the top managers respond to incentives that are

different than those of the owners, then the lack of a connection between their pay and corporate performance should be seen empirically in a low correlation between pay and performance, ceteris paribus.

This lack of pay for performance has been investigated recently, both theoretically and empirically, by Robert Frank (1984). Frank brought renewed interest to an old theme in economics, pointing out that utility functions that do not exclude important social relations may help explain how compensating differentials for status might compress firm wage distributions. In other words, Frank argues that by trading off status for wages the firm's pay scale may be more egalitarian than payment for marginal products would predict. CEOs, who are commanding the largest firms in the U.S., certainly have high status within their firms. If Frank's hypothesis is correct, then the over 2 million dollar average ($2,090,191 in 1988) the CEOs of the nations largest firms receive may be an understatement of their contribution to the firm.

Is Frank's hypothesis applicable to the highest reaches of American firms or are their high salaries evidence that they are beyond the control of the shareholders? If Frank's hypothesis applies to CEO's, then his prediction of greater equality in pay than performance alone would dictate would give a similar prediction to that of Berle and Means. Both of these theories then predict no clear connection between CEO pay and corporate performance. Evidence here is brought to bear in an attempt to decide which theory seems better able to explain CEO compensation.

Data on CEO earnings from America's top 1,000 corporations for 1988 and 1989 will be used here to see if this high compensation can be linked with corporate performance and if the compression hypothesis posited by Frank can be supported.

The paper is organized as follows. First, the theoretical arguments for CEO compensation and competitive

wage determination in light of possible compensating differentials are summarized. Next, the model and the data used are discussed. Finally, the empirical results of estimates of earnings equations are presented, followed by the conclusion.

Theory

Neoclassical wage theory is founded on the competitive determination of the equality between wages and the employee's marginal product. Numerous authors have elaborated on this theory to help explain circumstances that seem at variance with what a simple theory would predict. Recent elaborations have included compensating differentials for the inherent riskiness of a job (see Thaler and Rosen 1975, Biddle and Zarkin 1988), the degree of turnover (see Smith 1979, Garen 1988), etc. Robert Frank (1984), working with the compensating differential concept a few years ago, asked the question: "Are workers paid their marginal products?" By using interdependent utility functions that include status as an argument, his theoretical conclusion and empirical results answered this question with a resounding no. In particular, Frank posited that cost-minimizing firms in competitive labor markets will have pay schedules (W) that are functions of marginal products (MP). He further argued that the slope of a wage schedule that is a function of the employees' marginal products (dW(MP)/dMP), instead of being unity, will be significantly less than one.

This prediction put in the framework of CEO compensation would be somewhat similar to Berle's and Means' theory of a technocratic usurpation of power. Berle's and Means' theory highlighting the lack of control of stockholders could be restated for CEOs as dW(MP)/dMP $\cong$ 0. Empirically this prediction might be difficult to disentangle from Frank's if only CEO's are considered.

However, the lack of a powerful connection between productivity and reward for the executives, resulting in a near zero derivative, may not hold true when considering the CEO versus other employees of the same firm. Under Berle's and Means' reasoning, the very powerful CEO may indeed have a higher marginal product than many others in the firm, but the inordinate amount of power the CEO (and other top managers) wields allows pay to far outstrip performance. Hence, when considering CEOs alongside other employees in the same firm the earnings function may in fact have a slope greater than one, contrary to Frank's prediction.

The Model and the Data

The model employed in the empirical analysis is an adaptation of the model used by Frank (1984). Salary and bonus of the CEOs are assumed to be a function of the firm's return on equity, hence to the owners of the firm the marginal product of the CEO is hypothesized to be reflected in the earnings of the firm. The CEO is certainly not the sole determiner of firm profitability, but as a steward of the firm his salary should correlate with the return to his ultimate employers, the stockholders.

The Securities and Exchange Commission requires public companies to report to stockholders, in the company's proxy statement, the dollar compensation of the five highest paid employees, but formulas to determine compensation tied to the companies stock, profits, etc., are not often made public. These formulas are usually used to determine the bonus and/or the long-term compensation (e.g., stock options). A common type of formula of those made public would, for example, create a fund for the top executives of 6 percent of net income after paying a 7 percent return on equity (a "six-over-seven" formula). In looking for any pay-for-performance correlation, the use of these formulas

by firms gives added significance to using return on equity (ROE) as the primary explanatory variable. The secrecy surrounding these formulas (when they exist at all) which often form the basis of long-term compensation, the irregular timing of redemption (and hence valuation), and the short time frame of the data set make using total compensation as the dependent variable undesirable, since this would bias the results towards no correlation between pay and performance.[ii] Other compensation that is not included in the dependent variable is the value of various perks that CEOs often enjoy. These perks tend not to make up as large a portion of American CEOs total compensation as it does for their European and Japanese counterparts, but the use of sizable perks is quite widespread.[iii] For example, it is estimated that 68 percent of CEOs use company cars, 40 percent use chauffeur service, 55 percent get country-club membership, etc.[iv]

To help explain the variance in compensation due to such factors as industry concentration, regional economic strength, etc., other variables were included to capture these effects. The inclusion of these additional variables helps prevent bias on the coefficient on ROE due to the omission of other possibly important factors. This inclusion of related variables, besides helping to prevent bias, allows an empirical test of alternative theories of CEO compensation. Hence, the equation estimated was,

Salary & Bonus = f(ROE, Tenure, Age, Sales, Industry,
                    Region, Time)   (1)

The data used here comes from data gleaned by the combined efforts of Standard & Poor's Compustat Services and Business Week magazine.[v] The executives selected for inclusion come from the top 1,000 U.S. publicly-held firms according to market valuation. After combining data for 1988 and 1989, the number of firms that had all of the

above mentioned variables for both years reduced the data set to 143 executives over the two years.

In operationalizing the earnings equation, equation (1) above was augmented with industry and regional interaction effects and the effects of ROE were also estimated as industry specific. Starting with the least restrictive specifications permitted by the data, constraints were gradually imposed that were considered acceptable by appropriate F tests (see Hsiao 1986).

If the standard hypothesis of neoclassical theory is correct, that these executives are paid their marginal product, then it is also true that ROE and sales are a function of the quality of the CEO that is hired; i.e., ROE and sales are a function of the dependent variable. Hence, under the hypothesis that these workers are paid their marginal product, equation (1) becomes part of a simultaneous equation system. To deal with the possible endogeneity of ROE and sales, these variables were instrumented. The Kiviet-Wu instrument validity test was used to compare the relative merits of the least squares and instrumental variable specifications.[vi]

Empirical Results

The summary figures in Table 1 indicate the CEOs averaged over $1.9 million dollars a year in total compensation over the two year period. There was a slight drop in average total compensation over the period that was coincident with a drop in the return on equity (from 16.9 percent to 15.4 percent), but at the same time the average combined salary and bonus went up slightly. The average age of the CEOs in the study were 57 years old (the youngest was 42 and the maximum was 76) and they had held the CEO position for about eight and half years. Of the fourteen industries in the sample, banking was best represented and

as expected the highest number of CEOs came from firms based in the northeast.

Table 2 shows that quite a difference exists in the ROE between the top and bottom twenty-five observations. This multiple of difference in ROE is not reflected in either total compensation or in the combined salary and bonus figures. This compression of pay relative to performance is more in line with Frank's (dW(MP)/dMP < 1) hypothesis than with Berle's and Means' (dW(MP)/dMP ≅ 0). Long-term compensation, which is often directly tied to stock performance, does seem to follow the changes in ROE much more closely.

The estimates of the earnings equation specified in equation (1) are reported in Table 3. The least squares estimate listed in column one is the best estimate according to F tests for parameter constraints.[vii] The pooled estimate of the ROE parameter reported in equation (1) shows statistical significance, albeit a weak one, in the relation between ROE and CEO compensation. The industry specific ROE parameters in the earnings equation in column (2) show little statistical strength, and in fact, as mentioned above, were rejected for the pooled ROE parameter in equation (1). The pooled estimate predicted that for every 1 percent increase in return that CEO pay will go up by a little over $7000.

The sales effect is the most powerful among all variables. The rather precisely estimated sales effect signifies that for every $1 million increase in sales, CEO compensation will take 2.1 percent of this increase, or $21,000. This strong connection between sales and CEO pay, and not between ROE and CEO pay, gives support to Berle's and Means' hypothesis that these executives are looking after the welfare of their bureaucracy and not necessarily the owners of the firm. This strong connection with firm sales introduces the possibility that executives may be taking such large increases in earnings that the wage

scale, with the high-end included, may actually be more dispersed (i.e., dW(MP)/dMP > 1). Estimates that middle-managers received only seventy-five percent of the percentage increase in top management pay in 1989 is additional evidence that just the opposite of compression is taking place.[viii]

Conclusion

The results seem to verify Berle's and Means' conjecture that a technocracy has wrested significant power from the stockholders (and nowadays that often means the workers of the firm as well).[ix] Frank's hypothesis is difficult to disentangle from this data but some of the results here and from other data lead to rejection of compression when the high end of the pay scale is considered together with middle and lower income workers. This could be due to the factors described in Berle's and Means' hypothesis, a general loss of worker clout, or some other explanation unexplored here. There is some small evidence here (e.g., Table 2) that if the sample is restricted to CEOs some wage compression may be observed, but outside of restricted pay ranges this effect seems to be swamped by other factors, even making the observed wage scale amplified; i.e., the opposite of compressed.

Since only the top executives' pay is required in company proxy statements, evidence for or against wage compression at the high-end of the pay scale is difficult to obtain, but aggregate data is highly suggestive of the opposite having taken place. CEO pay has gone from approximately 19 times greater than that of an engineer in 1960 to over 44 times greater in 1988. The same relative increase is evidenced in comparison to other occupations as well.[x] The above change in relative pay is actually an underestimate of the change that has taken place in after-tax income.

The democratic angst that many feel at hearing of such high salaries may have an economic counterpart apart from the waste of just being greater than individual performance.

Recent developments in micro and macroeconomics have pointed to the possibility that an economy based on an assortment of participation schemes (e.g., profit-sharing, ESOP's, etc.) may have positive effects on productivity by increasing worker identification with the firm, increasing information flows, etc (see Weitzman 1985, Rosen and Quarry 1987). These participation schemes are unlikely to be effective if the rewards from increased productivity are to be disproportionately bestowed upon top management.[xi]

The CEOs of these companies do not seem to be complaining these days of too small a pay check, but many stockholders are.[xii] Few companies are likely to follow the strict five-to-one ratio in the pay scale of the quickly growing Ben & Jerry's ice cream company, but the days of the unfettered compensation committee created by management is also unlikely to continue.[xiii] The current practice in many companies of management hiring compensation consultants to tell the stockholders what management pay should be is likely to be gradually replaced by committees with more outside representation and with compensation formulas that tie pay more closely to company performance.

Table 1
Summary Statistics of Relevant Variables[xiv]

Variable		Mean	Standard Deviation
Total Compensation	Pooled	$1,905,712	1,886,753
(in 1988 dollars)	1988	2,090,191	2,200,570
	1989	1,721,233	1,493,119
Salary and Bonus	Pooled	1,103,363	568,313
	1988	1,100,058	564,884
	1989	1,106,669	573,342
Long-term Compensation	Pooled	809,349	1,698,835
	1988	990,133	2,012,857
	1989	614,565	1,290,863
Sales	Pooled	7,617,388,000	10,493,214,000

	1988	7,442,537,000	10,355,703,000
	1989	7,792,240,000	10,656,132,000
Return on Equity	Pooled	16.15	10.73
	1988	16.90	8.41
	1989	15.40	12.62
CEO Tenure (years)	1988	8.46	6.84
CEO Age	1988	57.09	5.85
Profits	1988	514,939,000	712,871,000
Assets	1988	16,394,642,000	25,890,364,000

Table 1, continued

Industry (number of firms)	
1. Banks and bank holding companies	20
2. Chemicals	10
3. Conglomerates	9
4. Drugs	10
5. Electronics	10
6. Food Processing	15
7. Natural Resources (Fuel)	11
8. Nonbank Financial	17
9. Office Equipment & Computers	13
10.Paper & Forest Products	9
11.Publishing, Radio & TV	10
12.Service Industries	8
13.Telecommunications	12

14.Utilities   19

Region (number of firms)
Midwest   47
Northeast   68
Northwest   4
Southeast   18
Southwest   36

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Table 2

Comparison of Data of the Top Twenty-Five and Bottom Twenty-Five Observations Ranked According to Return on Equity

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Variables	Top 25	Bottom 25

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Return on Equity	37.67	−7.50
Total Compensation ($000's)	3,210	1,491
Salary and Bonus	1,275	997
Long-term Compensation	1,939	494

Sales (millions of $)	4,919	9,737
CEO Tenure (years)	8.6	6.9
CEO Age	58.1	58.2
Midwest (observations from)	12	4
Northeast	9	14
Northwest	0	0
Southeast	2	1
Southwest	2	6
1. Banks and bank holding companies	0	8
2. Chemicals	6	1
3. Conglomerates	0	1
4. Drugs	7	0
5. Electronics	0	0
6. Food Processing	6	2
7. Natural Resources (Fuel)	0	4
8. Nonbank Financial	0	1
9. Office Equipment & Computers	2	1
10.Paper & Forest Products	0	0
11.Publishing, Radio & TV	2	1
12.Service Industries	2	1
13.Telecommunications	0	2
14.Utilities	0	3

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Table 3

**Estimates of Earnings Equations From 143 Top U.S.
Corporations During 1988 and 1989.**
(Dependent variable is salary and bonus.
Standard errors are in parentheses.)

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	(1)	(2)
Intercept	−14.54	5.23
(Northeast Utilities)	(371.82)	(413.88)
Return on Equity	7.26	
	(2.95)	
Sales	0.021	0.022
	(0.003)	(0.003)
Tenure	−1.37	−1.32
	(4.90)	(5.07)
Age	7.34	7.21
	(5.86)	(6.11)
Industry Specific Return on Equity (ROE)		
1. ROE-Banking (ROE)		2.84
		(5.57)
2. ROE-Chemicals		2.33
		(9.00)
3. ROE-Conglomerates		−12.87
		(22.13)
4. ROE-Drugs		11.24
		(10.22)
5. ROE-Electronics		6.55
		(34.02)
6. ROE-Food Processing		6.96
		(9.13)

Table 3, continued

7. ROE-Fuel		8.11
		(11.79)
8. ROE-Nonbank Financial		4.97
		(16.16)
9. ROE-Office Equipment & Computers		24.27
		(9.09)

10. ROE-Paper and Forest		28.50
		(34.26)
11. ROE-Publishing, Radio & TV		2.93
		(16.76)
12. ROE-Service Industries		-18.39
		(25.00)
13. ROE-Telecommunications		15.63
		(12.39)
14. ROE-Utilities		6.08
		(10.97)

Industry Dummy Variables

1. Banks and bank holding companies	519.43	564.53
	(237.50)	(262.79)
2. Chemicals	283.34	397.30
	(219.44)	(340.87)
3. Conglomerates	312.25	567.99
	(236.32)	(386.47)
4. Drugs	651.47	553.32
	(217.61)	(329.08)
5. Electronics	210.31	211.91
	(216.54)	(561.45)
6. Food Processing	208.69	203.77
	(360.22)	(400.90)
7. Natural Resources (Fuel)	266.97	241.86
	(205.30)	(283.44)

Table 3, continued

8. Nonbank Financial	327.34	365.34
	(387.13)	(547.93)
9. Office Equipment & Computers	652.40	274.21
	(214.90)	(303.03)

10.Paper & Forest Products	437.54	−3.13
	(367.27)	(792.26)
11.Publishing, Radio & TV	436.18	505.29
	(360.76)	(477.97)
12.Service Industries	579.42	946.05
	(275.90)	(465.68)
13.Telecommunications	188.64	61.08
	(275.44)	(341.04)
Regional Dummy Variables		
Northwest	−56.54	53.13
	(461.26)	(506.73)
Southeast	−45.32	−46.80
	(253.97)	(256.79)
Southwest	108.25	100.40
	(215.68)	(226.44)
Time Dummy Variable	4.23	5.08
	(51.03)	(52.91)
Interaction terms between Industry and Region	yes	yes
Number of Observations	346	346
SSE	64,205,084	62,523,794
R^2	0.42	.44

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[i]   Katharine Graham of the Washington Post is the only
woman CEO among the U.S.'s top 1000 firms (the sample which
will be used here).

[ii]   Total compensation (in standard accounting terms) is
equal to salary plus bonus plus long-term compensation.
Long-term compensation, usually in the form of stock
options, is typically either very large in a particular
year or zero. Note the large standard deviation for long-
term compensation in Table 1.

[iii]   Our competitors may receive more in perks, but their
total compensation, especially their take-home
compensation, is considerably below that of their American
counterparts.

[iv] To gauge the extent of other perks see the <u>Wall</u> <u>Street</u>
<u>Journal</u>, April 18, 1990.

[v] See in particular the issues May 1, 1989, October 20,
1989, and May 7, 1990.

[vi] The instrumental variables used were profits, assets,
tenure, age, industry dummies, a time dummy, regional
dummies, industry and regional interaction effects, and
following MaCurdy and Pencaval (1986), industry-specific
dummies interacted with time. The instrument validity test,
specified below, comes from Kiviet (1985). References for
similar tests are found in Wu (1973) and Hausman (1978).

$$\chi^2_{(h)} = T \ [(RRSS - URSS)/URSS]$$

where URSS is the OLS residual sum of squares of the unrestricted model,

$Y = X\beta + V\delta + $ error

where V = Xhat - X (for only those x's estimated by instruments)

and RRSS is the OLS residual sum of squares of the model with V restricted to equal zero.

[vii] For example, the F test between column (1) and (2) gave a computed value of 0.58 versus a critical value of 2.04 with 13 and 346 degrees of freedom and a significance level of 0.01. The Kiviet-Wu test of instrument validity for column (1) gave a computed value for the chi-square statistic of 6.05 versus a critical value of 9.21 with 2 degrees of freedom and a significance level of 0.01, hence the least squares estimates are reported.

[viii] Wall Street Journal, April 18, 1990. Other data mentioned in the same issue points to the same conclusion, i.e., only personnel managers were estimated to have had higher percentage increases in their compensation over the last decade.

[ix] Corey Rosen and Michael Quarry (1987, p.126) report that since 1974 "the number of employee-owned (or partially owned) companies has grown from about 1,600 to 8,100, and the number of employees owning stock has jumped from 250,000 to more than eight million."

[x] For example, CEO pay went from approximately 41 times the average factory worker pay in 1960 to over 93 times in 1988, for schoolteachers the ratio went from 38 to 72 in

the same period. See Business Week (1989) and the Bureau of Labor Statistics.

[xi] Frank's second proposition would support this point, that "other things equal, as tasks performed by a group involve more sustained and intense interaction and contact between coworkers, the values taken by dW/dMP must be smaller and/or the variation of earnings values included in the group must diminish."

[xii] See for example the case of Emerson Radio in the New York Times August 26, 1990, p. F-17.

[xiii] Ben & Jerry's is a Vermont-based company, known for its social responsibility, that has blossomed in the 1980's into a network of nationwide franchises. For more information see the Burlington Free Press, September 4, 1989, p. G-14.

[xiv] All data here are available from either Standard & Poors or Business Week. All monetary figures are in 1988 dollars.