

THE FLATTENING FIRM: EVIDENCE FROM PANEL DATA ON THE CHANGING NATURE OF CORPORATE HIERARCHIES

Raghuram G. Rajan and Julie Wulf*

Abstract—Using a detailed database of managerial job descriptions, reporting relationships, and compensation structures in over 300 large U.S. firms, we find that firm hierarchies are becoming flatter. The number of positions reporting directly to the CEO has gone up significantly over time while the number of levels between the division heads and the CEO has decreased. More of these managers now report directly to the CEO and more are being appointed officers of the firm, reflecting a delegation of authority. Moreover, division managers who move closer to the CEO receive higher pay and greater long-term incentives, suggesting that all this is not simply a change in organizational charts with no real consequences. Importantly, flattening cannot be characterized simply as centralization or decentralization. We discuss several possible explanations that may account for some of these changes.

I. Introduction

ECONOMIC theorists have long advocated a move away from seeing the firm as a black box and toward focusing on its internal organization instead. For example, as Williamson (1981) argues, viewing the firm and its organization as a “governance” structure rather than simply as a production function would help us understand better the boundaries between the firm and the market.

Work from the 1960s through the early 1980s (see, for example, Williamson, 1967; Calvo & Wellisz, 1978, 1979; Rosen, 1982) followed this approach by seeking to explain the size of firms as a consequence of the limitations on governance that can be exerted by corporate hierarchies. Broadly speaking, hierarchies emanate from the need to supervise workers. Any manager has limited time to supervise employees, so his span of supervision will be limited (Calvo & Wellisz, 1979; Rosen, 1982), and the number of layers in the organization will also be limited by the loss of control across levels (Williamson, 1967; Calvo & Wellisz, 1978). As a bonus, this work also explains why more talented employees will occupy higher positions in the hierarchy—because their effort affects more employees (see Calvo & Wellisz, 1979; Rosen, 1982). Thus at once, two stylized facts about corporations are explained—that larger firms pay managers more, and that wages go up as one moves up the hierarchy.

Received for publication December 7, 2004. Revision accepted for publication November 22, 2005.

* GSB, University of Chicago; and Wharton School, University of Pennsylvania, respectively.

We are grateful to Katie Donohue at Hewitt Associates, K. Subramaniam, and Talha Noor Muhammed for assistance in data collection. We would like to thank seminar participants at Wharton, the University of Chicago, Columbia University, the NBER Organizational Economics Conference, and the Harvard Business School Strategy Conference, and especially George Baker, Peter Cappelli, Brian Hall, Brigitte Madrian, Kevin Murphy, and Joel Podolny. Wulf acknowledges research support from the Reginald H. Jones Center for Management Policy, Strategy and Organization at the Wharton School of the University of Pennsylvania, and Rajan thanks the Center for Research on Securities Prices, the Center for the Study of the State and the Economy, and the National Science Foundation for research support.

Since this early work, there has been much more theoretical work trying to explain other aspects of firm hierarchies. Yet we don't have very many more stylized facts to discipline the theory, despite the fact that corporations in the United States have been changing tremendously. Peripheral businesses have been divested as corporations focus more on core areas, and peripheral activities have been outsourced [see, for example, the account in Powell (2001)]. At the same time, large corporations have been merging at a historically unprecedented rate (see Pryor, 2000). Even while corporate boundaries are being redrawn, there is some suggestion that the very nature of employment relationships is changing (see, for example, Osterman 1996; Holmstrom & Kaplan, 2001; Rajan & Zingales, 2000).

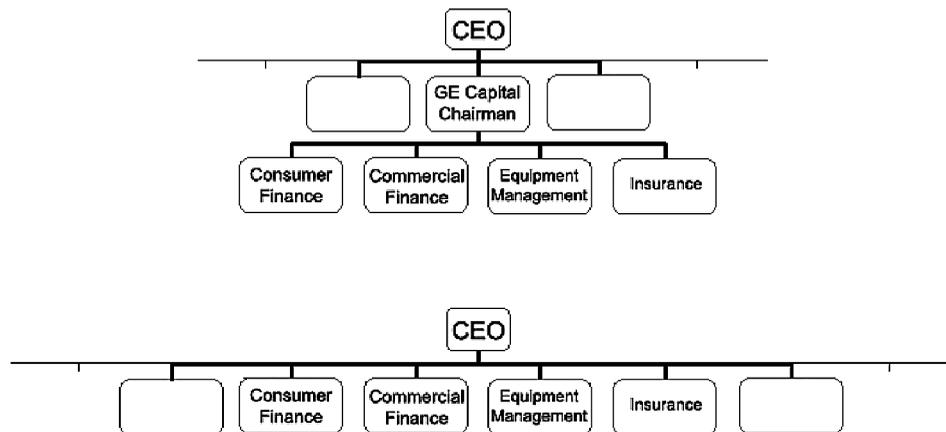
General Electric's recent organizational changes illustrate the type of facts that might be of interest to organizational theorists. The former chairman of GE Capital, who reported directly to the CEO, resigned from his position, and the four business unit heads started reporting directly to the CEO. Jeffrey Immelt, the CEO of GE, explained the decision thus: “The reason for doing this is simple—I want more contact with the financial services teams. . . . With this simplified structure, the leaders of these four businesses will interact directly with me, enabling faster decision making and execution.”¹ In this example, GE's organization became flatter: the CEO's span of control (or the number of positions reporting directly to the CEO) increased by 3 (owing to the loss of the chairman of GE Capital and the gain of four unit heads: consumer finance, commercial finance, equipment management, and insurance), and the average number of reporting levels between the unit heads and the CEO in GE declined (see figure 1).

Is this pattern of change special to GE, or is it more systematic? Perhaps a careful documentation of what fundamentally, if anything, has changed in corporate hierarchies will give us a new set of facts to explain, and hopefully a better way to understand the boundaries between the firm and the market. Certainly, we have learnt a lot by trying to explain stylized facts about static differences between firms, and even past changes [for example, Williamson's (1975, 1985) work on the movement from the U-form to the M-form of organization]. It is time to add more facts to the theoretical mill, and to offer preliminary explanations for them.

We examine how corporate hierarchies have changed in the recent past. We use a detailed database of job descriptions of top managers, reporting relationships, and compen-

¹ General Electric press release titled “GE Announces Reorganization of Financial Services; GE Capital to Become Four Separate Businesses,” July, 26, 2002.

FIGURE 1.—GENERAL ELECTRIC: CHANGE IN CEO SPAN OF CONTROL AND ORGANIZATIONAL LEVELS, JULY 2002



sation structures in over 300 large U.S. firms tracked over a period of up to 13 years. We focus on the seniormost levels of the hierarchy: after all, it is the CEO and other members of senior management who make resource allocation decisions that ultimately determine the firm's performance (and most obviously represent the "managers" in the theories).

We document that the flattening of the senior management hierarchy reported in the General Electric example is widespread in the United States among leading firms in their sectors.² Our first finding is that the number of managers reporting to the CEO has increased steadily over time, from an average (median) of 4.4 (4) in 1986 to 8.2 (7) in 1998.³ We consider several simple explanations for the increase in CEO span of control including firm growth, addition of new positions (such as the chief information officer), and mergers. Taken together, these explanations account for only part of the trend.

Our second finding is that the *depth*, which is the number of positions between the CEO and the lowest managers with profit center responsibility (division heads), has decreased by more than 25% over the period.⁴ Moreover, the number of division heads reporting directly to the CEO has tripled. One possible explanation of all this is that the organizational hierarchy is becoming flatter.

² Based on a variety of statistical tests, we conclude that our sample is representative of Fortune 500 firms. We discuss this in detail in section II B.

³ Others have found, using smaller data sets and focusing on particular industries, that the manager's span of control seems to be increasing (see, for example, Scott, O'Shaughnessy, & Cappelli, 1996), but these studies typically use an indirect measure of span (the number of managers at one level divided by the number of managers at the next level) and focus at levels below the CEO. Our measure of CEO span is potentially more precise, because we know who reports to the CEO.

⁴ Baker, Gibbs, and Holmstrom (1994) find that the number of levels is constant over time for the single firm in their study. Using detailed personnel records, they infer the number of levels from information about moves between job titles and consider all levels within the firm. By contrast, we focus only on the levels between senior management positions, but have a potentially more accurate measure because of information on reporting levels.

Another possible explanation, however, is that fewer but larger units are being given profit center responsibility. In other words, it may be that firms have regrouped units into larger divisions so that division heads have become important enough to report to the CEO. But when we focus only on divisional manager positions that report over multiple years (and thus are unlikely to be created or even greatly affected by organizational restructuring), we find that despite little change in division size, these positions have a higher probability of reporting to the CEO, as well as a shorter distance from the CEO on average, over time. Moreover, more of these positions are getting increased authority by being denominated "officers" of the firm. So hierarchies do seem to be getting flatter, even while authority is being delegated down the organization.

One way organizations can become flatter is by eliminating intermediary positions between the CEO and division heads, as in the GE case. We find evidence of this. For instance, the *chief operating officer* (COO), who typically stood between the CEO and the rest of the firm, is increasingly rare. The number of firms with COOs has decreased by approximately 20% over the period.

It is always possible that organizational structure is simply a way of conveying status and is otherwise meaningless. For example, some sociologists argue that informal networks play a much more important role than formal titles and reporting relationships in determining information flows and decision-making. To see whether the change in organizational form has effects outside the minds of managers, we examine how pay changes with organizational structure. We find both salary plus bonus and long-term incentives for a divisional manager position increase as it gets nearer the top, even after correcting for other determinants of pay like the number of employees under the position's supervision.

In sum, the CEO seems to be reducing the organizational distance between him and operational managers such as division heads. Yet it does not appear he is completely

taking over the decision-making power or the supervisory power of the eliminated intermediate layers of management. Closer divisional managers are getting more authority by being appointed officers, a fact further corroborated by their higher pay. Moreover, their greater long-term incentives suggest that their decisions are being guided by stronger incentive pay rather than close monitoring. Though the CEO may be in closer contact with operational managers than before, he is simply not trying to substitute himself for the eliminated layers.

Taken together, these findings suggest that corporate hierarchies are becoming flatter. It is not easy to ascribe the label “centralization” or “decentralization” to this. On the one hand, the CEO is getting directly connected deeper down in the organization, a form of centralization. Increasing span of control suggests he is more directly involved in decision-making across a greater number of organizational units. On the other hand, decision-making authority and incentives are also being pushed further down, a form of decentralization—or, using the jargon, *empowerment*.

What could explain the findings? Three possible classes of explanations are (i) an increase in the competitiveness of the external environment, forcing the need for a more streamlined organization, (ii) an improvement in corporate governance, forcing CEOs to eliminate excessive layers of managers built up during past empire building, and (iii) advances in information technology that expand the effective span of control of top managers. Although we will lay out the rationale for each class of explanations, as well as possible ways to test them, detailed testing is beyond the scope of this paper.

We are, of course, not the first to point out that organizations might be becoming flatter. This certainly is conventional wisdom in the business press, and a number of academic papers have also mentioned it (see, for example, Powell, 1990; Osterman, 1996; Scott, O’Shaughnessy, & Cappelli, 1996; Useem, 1996). However, no research we are aware of systematically quantifies these changes, correlates them with compensation, and discusses possible explanations of the observed patterns.

The remainder of the paper is outlined as follows. In section II, we describe the data, in section III we establish the facts, and in section IV we discuss possible explanations. We conclude in section V.

II. Data Description

A. The Sample

Empirical work on the organizational structure of firms is limited. This is primarily due to the lack of detailed information on structures and the difficulty in finding measures that allow comparisons across firms. As a result, previous research relies on either detailed data sets of a single firm [such as the personnel records in Baker et al. (1994)] or less detailed data on a smaller sample of firms [such as the

compensation survey data on 11 insurance firms in Scott et al. (1996)].⁵ These studies typically infer the number of levels in the hierarchy from promotions between positions or measure the span of control in terms of ratios of the numbers of employees at different organizational levels. By contrast, the primary data set used in this study includes a panel of more than 300 publicly traded U.S. firms over the years 1986–1998, spanning a number of industries. We use detailed information on job descriptions, titles, reporting relationships, and reporting levels of senior and middle management positions that allow us to characterize organizational structures of firms in a potentially more accurate way than previous research.

The primary data used in this study are collected from a confidential compensation survey conducted by Hewitt Associates, a leading human resources consulting firm specializing in executive compensation and benefits.⁶ The survey is the largest private compensation survey (as measured by the number of participating firms) and is comprehensive in that it collects data on more than 50 senior and middle management positions including both operational positions (such as the chief operations officer and divisional CEO) and staff positions (such as the chief financial officer and head of human resources).⁷ The survey typically covers all the positions at the top of the hierarchy and a sample of positions lower down. An observation in the data set is a managerial position within a firm in a year. The data for each position include all components of compensation, including salary, bonus, restricted stock, stock options, and other forms of long-term incentives (such as, performance units). To ensure consistency in matching these positions across firms, the survey provides benchmark position descriptions and collects additional data for each position, including the job title, the number of employees under the position’s jurisdiction, the title of the position that the job reports to (that is, the position’s boss), and the number of reporting levels between the position and the board of directors.

We believe the survey data are accurate, for several reasons. First, Hewitt personnel are knowledgeable about survey participants, because they are typically assigned to specific participants for several years. Furthermore, although the participating firms initially match their positions to the benchmark positions in the survey, Hewitt personnel follow up to verify accuracy and spend an additional 8–10 hours on each questionnaire, evaluating the consistency of responses with public data (such as proxy statements) and

⁵ There are several early empirical papers on organizational structure using cross-sectional techniques (for example, Child, 1973; Pugh et al., 1968).

⁶ We discuss below (section II B) some possible selection issues associated with this sample.

⁷ In this study we use a subset of the survey’s benchmark positions: position descriptions are listed in the appendix.

TABLE 1.—DESCRIPTIVE STATISTICS—WHOLE SAMPLE (UNBALANCED) AND BALANCED SAMPLE

A. Firm Characteristics of Sample									
Variable	Whole Sample (Unbalanced)				Balanced Sample (N = 51)				
	Mean		STD	N	Mean		STD	N	
	1986	1998	1998	(firm-yr)	1986	1998	1998	(firm-yr)	
Size (000's emp.)	47.45	49.49	92.27	3270	85.86	73.81	106.52	645	
Profitability	0.167	0.189	0.098	3292	0.162	0.201	0.093	640	
Age (years)	—	84.8	40.81	3292	—	105.3	33.47	640	
Number of segments	2.99	3.21	1.85	2519	3.29	3.91	1.86	609	
Inst. shareholders (%)	51.6	61.7	15.9	2393	51.2	60.9	11.2	510	

B. Industry Characteristics of Firms in Sample									
Industry (2-digit SIC)	Distribution of Sample by 2-digit SIC Code				Industry (2-digit SIC)	Distribution of Sample by 2-digit SIC Code			
	Whole Sample		Balanced Sample			Whole Sample		Balanced Sample	
	N (firm-yr)	% of Sample	N (firm-yr)	% of Sample		N (firm-yr)	% of Sample	N (firm-yr)	% of Sample
Food (20)	202	6.0	78	12.0	Transp. equip. (37)	232	6.9	78	12.0
Paper (26)	129	3.9	26	4.0	Instrumentation (38)	133	4.0	26	4.0
Chemical (28)	467	13.9	169	26.0	Communications (48)	161	4.8	13	2.0
Machinery (35)	340	10.1	26	4.0	Utilities (49)	399	11.9	13	2.0
Electrical (36)	153	4.6	26	4.0	Other	1,134	33.9	195	30.0

Notes: Whole sample includes all firms in the sample. Balanced sample includes firms that appear in the sample over the 13-year period. Panel A: Profitability is defined as EBITDA/sales. Age is defined as number of years since founding as listed in the *Directory of Corporate Affiliations*. Number of segments is that reported in the Business Segment file of Compustat. Institutional shareholders represents the percentage of shares held by institutions as reported by Spectrum.

across years.⁸ Participants use the survey results to set pay levels and design management compensation programs, an indication that they believe others treat the survey seriously.⁹

In table 1, we present descriptive statistics for the firms in the sample. The data set includes more than 300 firms; the exact number varies over the period, as firms enter and exit as survey participants. We report statistics on both the whole sample (unbalanced) and the subset of 51 firms that are included in the sample for the entire 13-year period (balanced). The firms in the sample are large, publicly traded U.S. firms that are well established and profitable, with average size of approximately 47,500 employees, age of 85 years since founding, and return on sales of 19% (see table 1A). The typical firm in the sample is thus a large, mature, stable firm, not one whose organizational structure is likely to be in flux. The sample firms span many industrial sectors of the economy, with some concentration in the food, paper, chemical, machinery, electrical, transportation equipment,

instrumentation, communications, and utilities industries (table 1B).

B. Sample Representativeness

Clearly, an important question in data sets such as this one is that of sample selection: whether the firms in the data set are or are not representative of, employers of similar size in their industry. The survey participants are typically the leaders in their sectors; in fact, more than 75% of the firms in the data set are listed as Fortune 500 firms in at least one year, and more than 85% are listed as Fortune 1000 firms. These firms represent a significant fraction of the activity of publicly traded firms in the United States. Based on all firms covered in Standard and Poor's Compustat database over the period of study, the survey participants represent approximately 33% of employees, 30% of sales, 20% of assets, and 40% of market value. If we limit the analysis to manufacturing firms, the Hewitt firms represent 42% of employees, 38% of sales, 39% of assets, and 52% of market value.

In general, Hewitt survey participants also participate in other compensation consulting firm surveys (Hay Associates, Mercer, or Towers Perrin, to name a few) and do so primarily to receive information about pay practices to use as a competitive benchmark in evaluating their own compensation programs.¹⁰ It is important to note that the sample

⁸ For example, a first-time participating firm reads the position descriptions and is shown examples like the one in figure A1 in order to match their positions to those covered in the survey.

⁹ There may be incentives for survey participants to misreport pay data in their survey responses for positions other than those reported in proxy statements. However, several facts offset the likelihood of this practice. First, for Hewitt clients, pay comparisons between the client and survey averages (excluding the client data) are provided to the board of directors, making it less likely that clients would misreport their own pay. Second, these surveys are completed by the firm's compensation analyst, and it would require a significant amount of internal coordination among several managers to intentionally misreport. Finally, the most important measures in this paper—namely, proxies for span and depth of the hierarchy—aren't reported to survey participants and are only used by Hewitt to improve accuracy in benchmarking positions across firms.

¹⁰ The value of a compensation survey to a participating firm depends on how representative it is of firms that the participant competes with in the executive labor market.

includes many more firms than Hewitt's consulting client base; at least 50% of the firms are survey participants with no client relationship to Hewitt.¹¹

We evaluate the representativeness of our sample by comparing key financial measures of our survey participants with a matched sample from Compustat. We begin by matching each firm in the Hewitt data set to the Compustat firm that is closest in sales within its two-digit SIC industry in the year the firm joins the sample. We then perform Wilcoxon signed rank tests to compare the Hewitt firms with the matched firms. Although the firms in the Hewitt data set are, on average, slightly larger in sales than the matched sample, we found no statistically significant difference in employment and profitability (return on sales).¹² We also found no statistically significant difference in sales growth, employment growth, or annual changes in profitability for all sample years. In sum, though the Hewitt firms are larger (measured by sales) on average than the matched sample, there is little additional evidence that these firms are not representative of the population of industrial firms that are leaders in their sectors.¹³ To sum up, the survey sample is probably most representative of Fortune 500 firms.

C. Measures of Organizational Structure

Our study focuses on two measures of organizational structure: the breadth and depth of the hierarchy. Breadth is represented by the CEO's span of control (*CEO Span*) and is defined as the number of positions reporting to the CEO. Because we know the title of the position that each position reports to (the position's boss), we can determine the positions that report directly to the CEO.¹⁴ Our other measure, depth, represents a vertical dimension of the hierarchy and

is defined as the number of positions between the CEO and the divisional CEO. In the survey, a *division* is defined as "the lowest level of profit center responsibility for a business unit that engineers, manufactures and sells its own products."

We focus on the divisional CEO position (hereafter referred to as divisional manager) for two reasons: (i) it is the position furthest down the hierarchy that is most consistently defined across firms, and (ii) it is informative about the extent to which responsibility is delegated in the firm. Figure A1 (at the end of the paper) displays an (edited) example from the survey that demonstrates to participants how to determine the number of reporting levels for each position. The management reporting relationships are clearly illustrated with the line of authority starting with the CEO as the most senior position, moving down to the COO, the group CEO, the divisional CEO, and finally the plant manager as the most junior management position. In this example, our measure of depth equals 2—there are two positions between the CEO and the divisional manager.

Other positions that might be informative about the depth of the hierarchy are group CEOs (managers with multiple profit center responsibility) and plant managers (managers with budget or cost center responsibility), but there are limitations to using either. Group CEOs are defined on the basis of their position in the hierarchy (proximity to CEO or COO). Hence it is harder to infer facts about depth or responsibility from their position. By contrast, divisional managers are defined on the basis of their responsibility, and hence we can infer more about hierarchies from where they are placed. Unfortunately, though, the definition of plant managers is not consistent across industries, especially when one moves from manufacturing to service firms.¹⁵

The survey data are supplemented with information from several other data sets (Compustat for financial and segment information; Securities Data Company for mergers; Spectrum for institutional shareholdings; Gompers, Ishii, and Metrick's (2003) index, based on IRR data, for governance information; and Directory of Corporate Affiliations for year of founding). Whereas the survey is conducted in April of each year and the organizational data describe the firm in the year of survey completion, some statistics (including the number of employees in a division) represent the end of the most recent fiscal year. To maintain consistency, we match the supplemental data sets using the year prior to the year of the survey. Finally, not all variables are

¹¹ One concern about sample selection bias is that firms participating in compensation surveys (Hewitt's or any others) may be inclined to adopt more modern compensation practices, including greater incentive pay. This is certainly possible. However, it is highly unlikely that survey participants flatten their organizational structure in response to survey data. As mentioned in an earlier footnote, the information on reporting levels in the survey is collected to ensure proper benchmarking of positions across firms, and no information about CEO span of control or organizational levels of divisional managers is provided to firms in return for participating.

¹² The Hewitt firms are larger in sales than the matched sample of firms because in a number of the cases, the Hewitt firm is the largest firm in the industry, thus forcing us to select a matched firm smaller in size.

¹³ We also calculate financial measures for the sample of Compustat firms with 10,000 employees or more over the period from 1986 to 1998 (excluding firms operating in financial services). We find that, on average, survey participants are more profitable, but growing at a slower rate, than those in the sample of large Compustat firms. Specifically, the sample average return on sales for survey participants is 17.8%, versus 15.7% for the sample of large Compustat firms, and the average sales growth is 5.7% versus 7.4%. This is consistent with our observation that the firms in our sample are likely to be industry leaders (hence slightly more profitable) and also large (hence with slightly slower growth). There is no reason why this should dramatically skew the inferences from the sample.

¹⁴ Because the survey is based on benchmark jobs, it is possible that nonstandard positions are excluded from the survey or added over time. Companies may differ systematically as to the percentage of management positions that are benchmark jobs, and this might bias our measure of the span. Because, however, the positions reporting to the CEO are the most

senior positions and the primary focus of the survey over the period, we expect the bias to be minimal.

¹⁵ The classic distinction between organizations that are organized by function and by divisions with profit-center authority is less relevant in this sample of firms. In fact, in this large sample of firms, pure functional organizations appear to be uncommon. Using the reporting of divisional and subsidiary data from the *Directory of Corporate Affiliations*, we were able to categorize the structure of just over half of the sample firms. Only one firm could be classified as a pure functional organization. In general, information about organizational form did not add explanatory power to our analysis.

TABLE 2.—ORGANIZATIONAL SPAN (*SPAN*): NUMBER OF POSITIONS REPORTING TO THE CHIEF EXECUTIVE OFFICER

Year	Whole Sample (Unbalanced)				Balanced Sample ($N = 51$)			Sample with 2 Consecutive Years		
	Mean	Median	STD	N (firms)	Mean	Median	STD	Changes Mean	Changes STD	N (firms)
1986	4.46	4	2.05	210	4.39	4	1.89			
1987	4.61	4	2.12	231	4.65	5	1.97	0.21	1.62	188
1988	4.75	4	2.67	236	4.65	4	2.09	0.11	1.72	203
1989	5.07	5	2.53	228	4.71	5	1.95	0.14	1.99	200
1990	4.91	5	2.60	276	4.98	5	1.74	0.03	1.88	210
1991	4.81	4	2.96	289	5.25	5	2.08	-0.05	2.17	249
1992	4.89	5	2.50	290	4.96	5	2.12	0.02	1.73	260
1993	5.01	5	2.24	304	5.53	5	2.10	0.10	1.93	261
1994	5.38	5	2.45	298	5.82	5	2.15	0.33	1.82	256
1995	5.65	5	2.54	288	6.47	6	2.64	0.39	2.08	250
1996	5.46	5	2.56	280	6.31	6	2.32	-0.19	2.07	243
1997	6.10	6	2.94	248	7.08	6	2.75	0.58	2.37	223
1998	6.79	6	3.90	213	8.16	7	4.02	0.75	3.39	183
Average	5.21	5	2.70	261	5.61	5	2.58	0.19	2.10	222
N (firm-yr)				3,391						2,733

Notes: Whole sample includes all firms in the sample. Balanced sample includes firms that appear in the sample over the 13-year period. Sample with 2 consecutive years includes all the firms in the sample for the year and the year prior. Changes is the change in span between year t and year $t - 1$.

available for all positions, firms, and years, and due to limitations in matching with the supplemental data sets, our samples are smaller for some parts of the analysis.

III. The Facts

A. Increasing Span

Having described the data and their sources, let us now examine how firm hierarchies are changing over time. In table 2, we describe how the number of positions reporting directly to the CEO (that is, *CEO Span*) moves over the period. The number of positions reporting has gone up from a mean (median) of 4.46 (4) in 1986 to 6.79 (6) in 1998, an increase of approximately 50%. One might worry that some of the change is induced by changes in the composition of our sample over time. If we restrict ourselves to the 51 firms that appear throughout the 13 years of our panel, however, the change is even more dramatic. From a mean (median) of 4.39 (4) it goes up to 8.16 (7), an increase of 86%. Alternatively, in the last three columns in table 2 we report the average annual change in span for the firms that appear for two consecutive years in the data set. Cumulating that annual average change in span, we get a total of 2.42 over the 13-year period.

Is this simply “hardwired”? Could increasing CEO span reflect the natural growth of firms? No, because firms could accommodate growth by adding layers to the hierarchy rather than increasing the span of control, and because firms have not grown significantly over this period. In fact, the average size of the 51 firms appearing throughout, as measured by the number of employees, has fallen from 86,000 in 1986 to 74,000 in 1998 (see table 1A). In the unbalanced panel, the size of firms is roughly constant over time—approximately 48,000 in both 1986 and 1998. When we sort firms into quartiles based on the growth in the number of

their employees over the sample, we do not find any clear pattern in span across the quartiles (not reported in table).¹⁶ An obvious question is whether the growth in CEO reports is a result of mergers—are firms simply stitched together at the seams under a common CEO, and would the merger wave account for our findings? To address this we drop from the balanced sample all firms that undertook one or more significant acquisitions (amounting to more than 20% of assets in any year) in the previous 3 years. CEO reports still increase from 4.4 in 1986 to 8.2 in 1998. We also drop from the sample all firms that undertook significant acquisitions at any time during the period covered. Again, CEO reports increase from 4.4 in 1986 to 8.2 in 1998.

Another obvious question is whether the growth in CEO reports is due to increases in diversification. In fact, the average number of segments reported by Compustat (one measure of diversification) for the balanced sample increases from 3.3 in 1986 to 3.9 in 1998 (table 1A). However, in a firm-fixed-effects regression of the number of CEO reports on (the logarithm of) the number of employees, the number of segments, and a trend variable, the coefficient on the number of segments is insignificant, suggesting that the increase in span is not primarily related to increases in diversification.¹⁷

¹⁶ Firms may grow in size or complexity without adding more workers—for example, through outsourcing. To evaluate this, we estimate all regressions and replace firm and division employment with firm and division sales, respectively. We find that our results are generally robust using this alternative measure of size, with the rare exception noted.

¹⁷ One might even argue the reverse: the CEO plays a coordinating role, so one would expect more reports to the CEO when there is more of a need for coordination between various business segments, that is, when the firm’s segments or divisions are more related. This conjecture too is not borne out in the data. Using data on a division’s industry and the share of employees in a two-digit industry within the firm, we calculate a Herfindahl index (*HHI*) for the firm’s presence in different industries as a more refined measure of relatedness. In a firm-fixed-effects regression of the

TABLE 3.—ORGANIZATIONAL SPAN: REPORTS TO THE CEO BY POSITION (BALANCED SAMPLE; $N = 51$)

Year	Average Number											
	Corporate Staff Positions						Intermediaries		Unit Heads			
	Chief Information Officer	Human Resources	Chief Financial Officer	General Counsel	Strategic Planning	Public Relations	Chief Operating Officer	Chief Administrative Officer	Group Manager		Division Manager	
									Avg. No.	Probability	Avg. No.	Probability
1986	0.020	0.373	0.667	0.667	0.275	0.196	0.549	0.392	1.026	0.434	0.205	0.052
1987	0.078	0.451	0.686	0.667	0.255	0.235	0.529	0.353	0.897	0.432	0.340	0.097
1988	0.039	0.490	0.686	0.686	0.255	0.294	0.549	0.392	0.789	0.417	0.213	0.063
1989	0.020	0.490	0.706	0.725	0.255	0.333	0.510	0.314	0.947	0.407	0.205	0.073
1990	0.039	0.510	0.667	0.725	0.294	0.431	0.588	0.333	0.970	0.419	0.229	0.084
1991	0.039	0.549	0.706	0.745	0.314	0.451	0.529	0.392	1.143	0.490	0.255	0.108
1992	0.020	0.471	0.745	0.667	0.255	0.294	0.549	0.412	1.029	0.431	0.298	0.121
1993	0.039	0.529	0.863	0.784	0.255	0.275	0.412	0.314	1.353	0.545	0.609	0.215
1994	0.039	0.549	0.882	0.784	0.255	0.275	0.392	0.353	1.472	0.583	0.783	0.213
1995	0.039	0.627	0.902	0.784	0.275	0.353	0.392	0.353	1.737	0.619	0.860	0.213
1996	0.039	0.667	0.961	0.843	0.235	0.314	0.412	0.275	1.721	0.556	0.581	0.179
1997	0.078	0.706	0.941	0.902	0.235	0.412	0.431	0.275	2.051	0.670	0.535	0.159
1998	0.176	0.647	0.902	0.961	0.392	0.569	0.451	0.294	1.733	0.606	0.953	0.314

Notes: Balanced sample includes firms that appear in the sample over the 13-year period. Positions are described in the appendix. For the group and divisional manager positions, the averages and probabilities are calculated for the subset of firms reporting these positions. Probability is the fraction of group or divisional manager positions reported by the survey that report to the CEO.

As an aside, in what follows we have the option of reporting data for the balanced panel of firms reporting throughout or also reporting data for the unbalanced panel. The balanced panel has the virtue of allowing comparisons to be made for the same firms over time. It has the demerit of focusing only on survivors and therefore introducing potential biases. Fortunately, the patterns from the balanced panel look qualitatively like those in the unbalanced panel.

Could the increased span be a result of the creation of new positions such as chief information officer (CIO) or the increasing importance of existing positions such as head of human resources (HHR), who now join more traditional positions such as chief financial officer in reporting directly to the CEO? The data do not support this explanation.¹⁸ In table 3, we report for the balanced panel the average number of direct reports to the CEO from a particular position. Each CEO had, on average, 0.02 CIOs and 0.37 HHRs reporting in 1986. By 1998, each CEO had 0.18 CIOs and 0.65 HHRs reporting. Thus these two positions account for only approximately 0.45 of the increased reports to the CEO. Where do the rest of the reports (equal approximately to $8.16 - 4.39 - 0.45 = 3.32$) come from?

The answer seems to be that they come from traditionally more junior positions. The average number of group managers reporting directly to the CEO went up from 1.03 in 1986 to 1.73 in 1998 (see table 3). The number of division

managers reporting directly to the CEO went up from 0.21 in 1986 to 0.95 in 1998. Thus the increase in direct reports from positions traditionally lower down in the organization accounts for approximately 45% of what is unaccounted for ($0.70 + 0.74 = 1.44$ of 3.32).¹⁹

The number of divisional manager positions reported by survey participants has increased over time. So perhaps as important as knowing the average number of group or divisional managers who report to the CEO is knowing what fraction of the group or divisional managers covered by the survey report to the CEO. Call this the *probability* of reporting to the CEO. For group managers this probability increased slightly over the period, from 0.43 in 1986 to 0.61 in 1998 (see table 3). The probability that a divisional manager reports to the CEO consistently trended upward over the period, from 0.05 in 1986 to 0.31 in 1998.

Parenthetically, some traditionally senior positions have also become closer to the CEO. Whereas 67% of CFOs reported to the CEO in 1986, 90% did so in 1998. A similar pattern is seen for the general counsel. Law and finance seem to have become more important!

B. Decreasing Depth and Increasing Empowerment

Even though only some division managers report directly to the CEO, the trend for them to be closer to the CEO is more general. Table 4B column (ii) (balanced sample), suggests that the average depth at which the division manager is located below the CEO (the number of managers between the CEO and the division manager) has fallen, from

number of CEO reports on (the logarithm of) the number of employees, *HHI*, and a trend variable, the coefficient on *HHI* is insignificant, suggesting that the increase in span cannot be explained by a greater need for coordination.

¹⁸ The chief information officer (CIO, position 8 in the appendix) is defined as the highest level of operating management over the combined functions of programming, data processing, machine operation, and systems work related to data processing. Head of human resources (HHR, position 7 in the appendix) is defined as the head of all human resources with responsibility for establishing and implementing corporation-wide policies.

¹⁹ Some functions have increased considerably in importance. Only 0.2 public relations officers reported to the CEO in 1986, and the number increased to 0.57 in 1998. Corporate research and development positions and manufacturing positions account for approximately 0.20 of the remaining increase in the number of CEO reports.

TABLE 4.—DESCRIPTIVE STATISTICS—FIRM AND BUSINESS-UNIT (DIVISION) CHARACTERISTICS (MEANS AND CHANGES)

Year	A. Whole Sample (Unbalanced)					B. Balanced Sample ($N = 51$)				Sample with 2 Consecutive Years: Depth Changes (Mean)
	(i) Firm Size (000s empz.)	(ii) Depth	(iii) Division Size (000s empz.)	(iv) Division Coverage	(v) N (firms)	(i) Firm Size (000s empz.)	(ii) Depth	(iii) Division Size (000s empz.)	(iv) Division Coverage	
1986	47.5	1.49	3.8	0.53	210	85.9	1.58	6.0	0.42	
1987	43.4	1.39	3.5	0.68	231	82.8	1.45	5.9	0.38	-0.06
1988	42.0	1.43	3.4	0.46	236	84.3	1.51	5.2	0.38	0.00
1989	46.2	1.34	3.3	0.44	228	86.8	1.46	5.2	0.36	-0.09
1990	44.7	1.28	3.1	0.39	276	86.2	1.36	5.1	0.33	-0.05
1991	42.1	1.26	3.1	0.40	289	86.9	1.33	4.2	0.35	-0.05
1992	41.3	1.29	3.1	0.37	290	83.2	1.35	4.4	0.33	0.03
1993	38.9	1.19	2.8	0.37	304	81.6	1.20	4.6	0.33	-0.04
1994	41.1	1.08	3.1	0.42	298	81.8	1.19	5.1	0.37	-0.05
1995	39.3	1.09	3.4	0.41	288	81.5	1.25	4.8	0.33	-0.01
1996	42.6	1.14	3.6	0.43	280	79.6	1.30	5.5	0.37	0.01
1997	45.2	1.18	3.3	0.38	248	75.4	1.41	2.8	0.34	-0.02
1998	49.5	1.14	3.7	0.39	213	73.8	1.18	4.7	0.40	-0.06
Average	43.1	1.26	3.3	0.43	261	82.7	1.36	4.9	0.36	-0.03

Notes: Whole sample includes all firms in the sample. Balanced sample includes firms that appear in the sample over the 13-year period. Sample with 2 consecutive years includes all the firms in the sample for the year and the year prior. Firm (division) size is the number of employees in the firm (division) in thousands. Depth is defined as the number of positions between the CEO and the divisional manager (see figure 2 for an example). Division coverage is defined as the ratio of the number of employees under divisional manager positions sampled by the survey to the total number of employees in the firm. Depth changes is defined as the depth in year t minus depth in year $t - 1$.

1.58 in 1986 to 1.18 in 1998, approximately 25%.²⁰ Interestingly, the correlation between *CEO Span* and *Depth* is significantly negative (correlation = -0.27 for the whole sample). Wider organizations are also less tall, so that, put in a time series context, organizations are becoming flatter. In what follows, we will focus on *CEO Span* as a measure of organizational structure (because we believe it is more comprehensively reported), though we will use *Depth* whenever appropriate.

Perhaps then the increasing number of reports to the CEO reflects restructuring of business units: Perhaps profit center responsibility has been taken away from smaller units, and they are now part of a larger, more important unit whose manager is, not surprisingly, closer to the CEO and now may even report directly to him. Again, this hypothesis does not seem consistent with the data. The average size of a division (the lowest level of profit center responsibility) has decreased from approximately 6,000 employees in 1986 to 4,700 employees in 1998 [see table 4B, column (iii)].

Of course, there may be a simpler explanation for our findings. The survey is not exhaustive, except at the highest levels in the organization. Perhaps, as the survey expanded over time, it picked up lower, more obscure divisional manager positions. This would explain why divisions are getting smaller (but not why their depth is decreasing). Nevertheless, even the premise is incorrect: the survey has expanded in the number of divisional manager positions reported but not in the fraction of the firm covered. For the constant sample, we calculate the ratio of the total number of employees under divisional manager positions sampled

by the survey to the total number of employees in the firm. As table 4B indicates, this ratio was 0.42 in 1986 and 0.4 in 1998. The coverage of the survey has not changed significantly.²¹

As yet, we cannot be sure whether the existing divisional manager positions became closer to the CEO or whether organizational change resulted in new divisional manager positions that were closer to the CEO. For example, if large firms started outsourcing more of their activities, new divisional managers might have been put in charge of units that were not large as measured by personnel, but were only the tip of a vast outsourced operation. It would not be surprising then that these important managers would be closer to the CEO.

One way to get at this is to follow the same divisional manager position over time. From the annual surveys, we identified which divisional manager positions were reported multiple times over the years. Focusing only on these positions, we regress attributes of the position (what its depth is, whether it reports to the CEO) against the size of the firm, the size of the division, year indicators, and an indicator for the position. These regressions should be viewed as attempts to establish partial correlations rather than as implied causal relationships. Significant coefficient estimates on the year indicators would only suggest that, keeping the other attributes of a position approximately constant, its place in the organizational hierarchy did change over time.

The regression estimates are reported in table 5. The standard errors for the reported estimates are clustered at the firm level, addressing the concern that division observations

²⁰ In the last column in table 4 we report the average annual change in depth for the set of firms that appear for two consecutive years in the data set. Cumulating that average change in depth for this set of firms, we get -0.03 over the 13-year period.

²¹ A similar conclusion is reached if one examines the coverage of group positions reported (results available on request from the authors).

TABLE 5.—MEASURES OF EMPOWERMENT—DIVISION-FIXED-EFFECTS REGRESSIONS

Independent variable	<i>DDEPTH</i> (i)	<i>CEORPT</i> (ii)	<i>OFFICER</i> (iii)
$\log(\text{Division Employees})$	-0.074*** (0.020)	0.019** (0.008)	0.034*** (0.011)
1987	-0.052 (0.040)	0.014 (0.015)	0.015 (0.012)
1988	-0.034 (0.058)	0.012 (0.020)	0.018 (0.016)
1989	-0.082 (0.061)	0.020 (0.020)	0.006 (0.017)
1990	-0.152** (0.060)	0.040* (0.024)	0.017 (0.020)
1991	-0.167*** (0.060)	0.049** (0.025)	0.030 (0.020)
1992	-0.132* (0.070)	0.047* (0.024)	0.027 (0.020)
1993	-0.195*** (0.069)	0.067** (0.027)	0.033 (0.024)
1994	-0.254*** (0.074)	0.095*** (0.029)	0.041 (0.026)
1995	-0.236*** (0.076)	0.095*** (0.033)	0.060* (0.034)
1996	-0.270*** (0.077)	0.088*** (0.032)	0.053 (0.035)
1997	-0.285*** (0.081)	0.098*** (0.038)	0.052 (0.041)
1998	-0.302*** (0.088)	0.071* (0.038)	0.045 (0.036)
Constant	2.077*** (0.143)	-0.066 (0.057)	-0.036 (0.077)
Observations	10393	10428	10428
Number of divisions	2360	2370	2370
R-squared	0.73	0.58	0.77

Dependent variables are *DDEPTH* (number of positions between CEO and divisional manager), *CEORPT* (divisional manager position reports to CEO), and *OFFICER* (incumbent in divisional manager position is corporate officer).

Notes: Includes all divisions in the sample that appear for at least two years. All specifications include division fixed effects. All variables have been Winsorized at the 99th percentile. *DDEPTH* is defined as the number of positions between the CEO and the specific divisional manager position. *CEORPT* is a dummy variable equal to 1 if the divisional manager position reports directly to the CEO and 0 otherwise. *OFFICER* is a dummy variable equal to 1 if the incumbent in the divisional manager position is a corporate officer and 0 otherwise. $\log(\text{Division Employees})$ is defined as the log of the number of employees in the division. All specifications report robust standard errors by clustering at the firm level. ***/**/* represent significance at the 1%/5%/10% level.

may not be independent across divisions within a firm.²² In column (i), the dependent variable is the depth of the specific position (*DDEPTH*). We find negative coefficients on all year indicators, with a trend of increasingly negative coefficients over time. That is, division depth is decreasing, and divisional manager positions are getting closer to the top. In column (ii), the dependent variable is 1 if the position reports to the CEO directly and 0 otherwise. We find that the probability of reporting to the CEO increases over time, as the year indicators become larger over the period. Also, the number of employees under a particular divisional manager position trends downward slowly (approximately 1% every year). This suggests that even though the structure of the division has not changed drastically over

time, its head has moved nearer the top. The organizational hierarchy is indeed becoming flatter.

Finally, a direct measure of responsibility is whether the holder of a position is designated an officer of the corporation: officers of the corporation are determined by both the individual's authority and the nature and extent of the individual's duties.²³ In column (iii) of table 5, the dependent variable is whether the divisional manager is designated an officer. The year coefficients exhibit a broadly increasing trend over the entire sample, with the year coefficients averaging 0.014 in the first third of the sample years (1987–1890), and 0.053 in the last third (1995–1998). Although only one of the year coefficients in the last third is significantly different from 0, collectively they are greater

²² Clustering standard errors at the firm level instead of the division level addresses the possibility that firms have certain rules (or standards) by which they place all of their managers. In this case, the different positions in a firm are not independent. Clustering by firm is a more conservative test and particularly important if there is a lot of covariance between the positions of managers in the same firm. In addition to clustering by firm, we estimate regressions that adjust standard errors for serial correlation (AR1) and heteroskedasticity across division manager positions. Because the statistical significances of the coefficients are similar for the two approaches, we choose to report standard errors clustered at the firm level.

²³ The term “officer” is defined by the Securities and Exchange Commission in Section 240.16 (rules governing insider trading) as “an issuer’s president, principal financial officer, principal accounting officer (or, if there is no such accounting officer, the controller), any vice-president of the issuer in charge of a principal business unit, division or function (such as sales, administration, or finance), any other officer who performs a policy-making function.”

than 0 at the 11% level.²⁴ By contrast, the year coefficients in the initial third of the sample are not statistically different from 0. The incumbent in the divisional manager position has become somewhat more likely to be designated an officer over time. Authority and responsibility are indeed moving further down.

C. Delaying

That the CEO is getting more directly connected—increasing span, reduced distance from managers—is consistent with anecdotal evidence that organizations have been getting rid of entire layers of middle management. In general, it is hard to find direct evidence of this at the level of detail our data set offers on reporting relationships—the mere fact that positions disappear does not mean that reporting has become more direct, for other positions could place themselves in the middle.²⁵

Not only do our data suggest that reporting has become more direct (for instance, that more division managers now report directly to the CEO), but they also suggest that the CEO is becoming more directly connected precisely because of the elimination of intermediate positions: Consider the position of the COO, who has historically served as an intermediary between the CEO and the rest of the organization. As table 3 indicates, the average number of COO reports to the CEO per firm has fallen from 0.55 to 0.45 over the same period. The position of chief administrative officer (CAO) also seems to exhibit a similar decline. The decline in COO and CAO positions that report to the CEO is primarily because these intermediate positions are being eliminated, and not necessarily because these officers have less access to the CEO. Conditional on a firm having a COO, the percentage of COOs that reported to the CEO didn't change over the period (very close to 100%). This suggests that the decline in COO reports to the CEO is due to the position being eliminated in the sample firms.

In Table 6, column (i), we return to the unbalanced sample and regress *CEO Span* against a constant, firm size (the log of the number of employees in the firm), firm, and year indicators. The trend in the coefficient estimates on the year indicators is significantly positive. *CEO Span* increases, on average, by approximately 0.16 every year. In column (ii), we also include an indicator for whether the firm has a COO and another indicator for whether it has a CAO. The coefficients on the year indicators fall slightly. Interestingly, the coefficient on the presence of a COO is negative, statistically significant, and

large (−0.96). Assuming the COO always reports to the CEO, this coefficient suggests his presence reduces the number of CEO reports, because an average of 1.96 managers who would otherwise report to the CEO now report to him. In other words, the COO is truly an intermediary.²⁶

In column (iii) we regress *Depth* on firm size and on firm and year indicators, and we find that the coefficients on the year indicators become increasingly negative over the period. Column (iv) suggests the presence of intermediaries like the COO and the CAO, increase the average depth at which division managers are positioned. If the COO stood between the CEO and all managers, the coefficient on the COO indicator would be 1. That it is lower suggests some divisional managers do not report via the COO. Parenthetically, note that the coefficient on firm size is positive, suggesting that growing firms seem to have greater depth.

Although the coefficients on the year indicators fall when we include indicators for the presence of these positions, they do not become insignificant. Thus the elimination of the COO and CAO positions accounts for part, but not all, of the trend. The flattening of organizations is more than the elimination of just a few key intermediate positions.

D. The Correlation with Wages

Are increasing span and decreasing depth simply changes on paper with no real consequences whatsoever? Does the ostensible proximity to the CEO simply reflect a greater desire on the part of managers for status, with no greater increase in real access? Evidence that more division managers are becoming officers suggests that organizations are changing in meaningful ways. And one strong piece of evidence suggests that these changes are not all form without any function: they seem to be accompanied by systematic changes in pay.²⁷

The data set we have has extensive data on compensation. We would like to see if the flattening of the hierarchy we have described has any correlation with pay patterns. To understand this, we examine the pay of divisional managers, who could be positioned anywhere from just below the CEO to far away.

In Table 7, we report how various attributes of the pay structure for firms vary as depth decreases. The first aspect of pay we consider is the divisional manager's salary and bonus. We regress the logarithm of this measure against the number of employees in the firm, the number of employees in the division, the depth at which the division manager is placed, and year indicators. The OLS estimate for the

²⁴ This is one situation where including division sales, as we have done, instead of division employees reduces the significance of the coefficients. Also, clustering by firm greatly reduces significance relative to clustering by division. When we cluster by division, seven of the year indicators are statistically significant.

²⁵ Earlier work has inferred reporting relationships from organizational positions (managers in lower layers are assumed to report to managers in the immediate higher layer). In this case, the elimination of some, but not all, positions in intermediate layers would not allow us to conclude that there is a change in reporting relationships.

²⁶ By contrast, the presence of a CAO increases CEO reports, but by less than 1. Because the CAO also typically reports directly to the CEO, the coefficient estimate of 0.344 suggests that the CAO also intermediates between lower positions and the CEO, but typically has fewer direct reports than the COO.

²⁷ Larcker, Lambert, and Weigelt (1993) evaluate pay differentials between different positions in a firm's hierarchy. However, they have no measure of CEO span or the number of levels between the CEO and division managers.

TABLE 6.—ORGANIZATIONAL SPAN AND DEPTH—FIRM FIXED-EFFECTS REGRESSIONS

Independent Variable	SPAN		DEPTH	
	(i)	(ii)	(iii)	(iv)
$\log(\text{Employees})$	-0.172 (0.234)	-0.163 (0.237)	0.307*** (0.081)	0.294*** (0.072)
<i>COO</i>		-0.964*** (0.148)		0.457*** (0.039)
<i>CAO</i>		0.344** (0.169)		0.038 (0.043)
1987	0.291** (0.138)	0.264** (0.133)	-0.092** (0.043)	-0.085** (0.039)
1988	0.320* (0.170)	0.216 (0.164)	-0.053 (0.053)	-0.011 (0.048)
1989	0.569*** (0.172)	0.462*** (0.164)	-0.143** (0.058)	-0.102* (0.054)
1990	0.544*** (0.178)	0.432** (0.170)	-0.183*** (0.063)	-0.141** (0.058)
1991	0.462** (0.188)	0.326* (0.178)	-0.215*** (0.062)	-0.152*** (0.057)
1992	0.562*** (0.194)	0.463** (0.185)	-0.139** (0.065)	-0.101* (0.057)
1993	0.661*** (0.190)	0.530*** (0.182)	-0.167** (0.066)	-0.098 (0.060)
1994	1.077*** (0.207)	0.917*** (0.200)	-0.219*** (0.067)	-0.142** (0.061)
1995	1.407*** (0.213)	1.242*** (0.207)	-0.231*** (0.071)	-0.146** (0.066)
1996	1.303*** (0.223)	1.154*** (0.220)	-0.283*** (0.069)	-0.208*** (0.065)
1997	1.776*** (0.244)	1.644*** (0.240)	-0.270*** (0.070)	-0.193*** (0.065)
1998	2.349*** (0.272)	2.183*** (0.269)	-0.345*** (0.079)	-0.251*** (0.073)
Constant	4.816*** (0.695)	5.244*** (0.702)	0.498* (0.253)	0.266 (0.222)
Observations	3264	3264	2381	2381
Number of firms	369	369	323	323
R-squared	0.49	0.52	0.65	0.71

Dependent variables are *SPAN* (number of positions reporting to CEO) and *DEPTH* (firm average number of positions between the CEO and the divisional manager).

Notes: Includes all firms in the sample that appear for at least two years. All specifications include firm fixed effects. All variables have been Winsorized at the 99th percentile. $\log(\text{Employees})$ is defined as the log of the number of employees in the firm. *COO* and *CAO* are dummy variables equal to 1 if the firm reports a chief operating officer and chief administrative officer, respectively. All specifications report robust standard errors by clustering at the firm level. ***/**/* represent significance at the 1%/5%/10% level.

coefficient of depth [table 7, column (i)] is negative and significant, suggesting that for each additional layer between the CEO and the divisional manager, the log of the latter's salary and bonus falls by 0.14, which is 29.4% of its standard deviation. The coefficient continues to be negative when we include fixed effects for the position [table 7, column (ii)], suggesting that specific divisional manager positions that are moving closer to the CEO over time get paid more.

We find similar results when the dependent variable is the ratio of the division manager's long-term incentive pay to the value of salary and bonus (typically stock and stock options).²⁸ The OLS estimate [table 7, column (iii)] suggests

²⁸ The value of long-term incentive pay is computed by Hewitt. Stock options are valued using a modified version of the Black-Scholes model that takes into account vesting and termination provisions in addition to the standard variables of interest rates, stock price volatility, and dividends. As is standard practice among compensation consulting firms, the other components of long-term incentives are valued using an economic valuation similar to the Black-Scholes that takes into account vesting, termination provisions, and the probability of achieving performance goals.

that long-term incentive pay for divisional managers goes down from a mean of 43.4% of salary and bonus to 37.1% for an additional layer between the CEO and the divisional manager. Including division fixed effects does not change the estimate significantly.²⁹

All this suggests that pay and incentives are adjusting to the change in organizational structure. Even controlling for the size of the division and the firm, division managers are paid more as they move closer to the CEO. This is therefore not the traditional Calvo-Wellisz (1979) or Rosen (1982) effect—it is not that these managers are becoming more important at the margin because they control larger operations.

Instead, it may well be that they are becoming more important because their decision-making is subject to less close oversight by intermediaries (though to more direct oversight by the CEO). In fact, as Aghion and Tirole (1997) argue, greater span may be a way for the CEO to commit to

²⁹ See Wulf (2006) for additional analysis of the relationship between divisional manager incentives and organizational structure.

TABLE 7.—DIVISIONAL MANAGER PAY AND DEPTH: OLS AND DIVISION FIXED-EFFECTS REGRESSIONS

Independent Variable	Divisional Manager Salary + Bonus		Divisional Manager LT Incentives	
	OLS (i)	Division Fixed Effects (ii)	OLS (iii)	Division Fixed Effects (iv)
$\log(\text{Employees})$	0.059*** (0.023)	0.060* (0.032)	0.046*** (0.015)	0.084* (0.047)
$\log(\text{Division Employees})$	0.128*** (0.013)	0.083*** (0.011)	0.042*** (0.008)	0.038*** (0.008)
<i>DDEPTH</i>	-0.141*** (0.026)	-0.065*** (0.012)	-0.059*** (0.015)	-0.053*** (0.012)
1987	0.080*** (0.016)	0.078*** (0.015)	0.035* (0.019)	0.022 (0.023)
1988	0.162*** (0.023)	0.139*** (0.020)	0.046 (0.029)	0.016 (0.028)
1989	0.182*** (0.024)	0.175*** (0.018)	0.058** (0.028)	0.052* (0.030)
1990	0.205*** (0.027)	0.202*** (0.022)	0.118*** (0.030)	0.115*** (0.030)
1991	0.213*** (0.026)	0.216*** (0.021)	0.098*** (0.027)	0.105*** (0.029)
1992	0.279*** (0.027)	0.281*** (0.022)	0.104*** (0.030)	0.108*** (0.031)
1993	0.291*** (0.029)	0.314*** (0.025)	0.092*** (0.026)	0.102*** (0.031)
1994	0.414*** (0.035)	0.402*** (0.026)	0.166*** (0.033)	0.160*** (0.039)
1995	0.431*** (0.039)	0.458*** (0.029)	0.222*** (0.037)	0.223*** (0.042)
1996	0.429*** (0.043)	0.464*** (0.033)	0.266*** (0.038)	0.304*** (0.044)
1997	0.526*** (0.048)	0.545*** (0.035)	0.382*** (0.045)	0.373*** (0.050)
1998	0.531*** (0.039)	0.539*** (0.037)	0.362*** (0.045)	0.351*** (0.056)
Constant	11.236*** (0.087)	11.427*** (0.124)	-0.061 (0.061)	-0.164 (0.150)
Observations	9915	9915	9915	9915
R-squared	0.43	0.86	0.17	0.66

Dependent variables are (log) divisional manager salary plus bonus and divisional manager LT incentives (ratio of value of long-term incentive pay to salary plus bonus).

Notes: Includes all divisions in the sample that appear for at least two years. All variables have been winsorized at the 99th percentile. Divisional manager LT incentives is defined as the ratio of the value of long-term incentive pay for divisional managers to the sum of the salary and bonus. Long-term incentive pay includes restricted stock, stock options, and other forms of long-term incentives (such as performance units, performance share plans, and phantom stock). Refer to footnote 27 in the text for the consulting firm's valuation of long-term incentives. *DDEPTH* is defined as the number of positions between the CEO and the specific divisional manager position. $\log(\text{Employees})$ is the log of the number of employees in the firm. $\log(\text{Division Employees})$ is the log of the number of employees in the division. All specifications report robust standard errors by clustering at the firm level. ***/**/* represent significance at the 1%/5%/10% level.

light monitoring and increased delegation of authority, as he does not have enough time for detailed scrutiny of all his subordinates. That authority is being delegated could also explain why long-term incentive pay is increasing for those who are moving closer to the top.

The reader should not, however, conclude that flattening is simply decentralization of CEO authority. A broader span of control also suggests the CEO's direct involvement in decisions across a greater number of organizational units. Let us now turn to possible explanations.

IV. Possible Explanations for the Flattening of Firms

A. Increased Competition in Product Markets

One set of possible explanations has to do with the more competitive environment in product markets. Deregulation and increased trade has enhanced product market competition over the last few decades. Not only has the required

speed of response for firms increased, it has put a premium on employee competence and creativity. The tall hierarchies of the past may no longer be as effective.

One reason may simply be because decisions need to be taken more quickly to take advantage of fleeting opportunities in the marketplace—this is suggested by the GE CEO Jeffrey Immelt's desire, cited in the introduction, for "faster decision making and execution." It takes time for each managerial layer to give approval to a decision. As the speed increases with which a final decision is needed to avail of opportunities, either a number of opportunities are forgone with the attendant loss of value, or final decisions are delegated further down a hierarchy with attendant loss of top management control. *Ceteris paribus*, Williamson (1967) or Calvo and Wellisz (1978) would suggest that organizations would tend to become flatter in this environment.

Also, greater competition may increase the complexity of the decisions that have to be made as well as the variety of data that impinge on the decision. Tall hierarchies with intermediate managers micromanaging the work of operational managers may stifle initiative (see, for example, Aghion & Tirole, 1997). Also, information may be hard to convey up a hierarchy with the necessary detail and color, thus reducing managers' incentive to collect it (Stein, 2002). Thus tall hierarchies may become dysfunctional, with top managers not having the information to make the right decisions and operational managers not having the incentive to make them.

Finally, as the development of financial markets has increased access to physical capital, and as human capital becomes more important to a firm's comparative advantage (see, for example, Dessein, 2002; Rajan & Zingales, 2000; Roberts & Van den Steen, 2000), tall hierarchies may lead to top management losing the residual rights of control. In Grossman and Hart (1986), subordinate managers are said to be controlled by virtue of top management's ownership (actual or delegated) of physical assets. If physical assets become relatively unimportant, ownership becomes less effective as a means of organizational control. Tall hierarchies become less viable. Instead, as Rajan and Zingales (2001) argue in their development of the Grossman-Hart framework, top management has to build up control. It does this by establishing direct contact with lower-level managers (that is, flattening the firm) and getting them to make human-capital-specific investments vis-à-vis top management.³⁰ Thus the human-capital-intensive firm is held together by a web of human-capital-specific investments, which are made possible by the flatter hierarchy. In addition, employees get the promise of substantial ownership rights, especially at the top, giving them an incentive to stay with the firm despite having many competitors for the top positions.

Tests of the broad hypothesis could be developed. For instance, using measures of the timing and extent of deregulation of different industries, we can check whether deregulation led to flattening. Of course, it would be important to check that the deregulation was not anticipated. Similarly, one can look at import penetration as a measure of enhanced competition. A preliminary analysis suggests that the trend of decrease in depth is more pronounced in industries where the percentage change in imports was higher between the years 1990 and 1994, based on data documented in Feenstra (1996). However, more careful analysis that corrects for the endogeneity of imports (imports are more likely in industries that are not efficient), and that distinguishes between imports of final

goods and imports of inputs, will be required for results to be convincing. We leave such analysis to future work.

B. *Improvements in Corporate Governance*

An important class of explanations has to do with agency costs. In particular, a number of theorists have hypothesized that management, left to itself, might want to expand its turf and sense of worth (see, for example, Jensen, 1986; Jackall, 1988; Osterman, 1996; Parkinson, 1958; Useem, 1996) by hiring legions of useless middle managers. This may have been possible in the past when management was inadequately monitored. Equivalently, if the external governance of the firm is poor, firms may not fire incompetent managers, but simply hire new ones to do their job.

If firms developed tall, overstaffed hierarchies because of empire building, then improvements in corporate governance could explain the trend toward flatter organizations. Governance benefited in the 1980s from the wave of hostile takeovers, which stepped up pressure on the large firms that constitute our sample. The corporate raider, Carl Icahn, described his goal as eliminating "layers of bureaucrats reporting to bureaucrats."³¹ In the 1990s, large institutional investors replaced the hostile takeover as the source of governance (see, for example, Kaplan, 1996). Useem (1996) suggests that the growing dominance of institutional investors in the stock market has forced structural change in corporations: the elimination of layers of middle management and the restructuring of firms into more autonomous business units.

However, when we regress the depth of a firm's organizational structure on crude proxies for the extent of governance pressure on the firm, such as the extent of institutional shareholding in that firm (lagged 1 year) or a measure of the strength of outside governance compiled by Gompers, Ishii, and Metrick (2003), we find little systematic relationship (estimates available from authors). Moreover, if greater depth were a symptom of empire building, it should hurt the firm's value, and we should see a negative correlation between *Depth* and the market-to-book ratio. In a regression of a firm's market-to-book ratio on firm size, number of segments (diversified firms typically have a lower market-to-book ratio), *Depth*, year dummies, and fixed effects for the firm, we find no relationship between the market-to-book ratio and *Depth*.

Of course, one explanation of these findings is that the market for corporate control worked perfectly. Some firms made timely changes in their organizational structure, while those that did not swiftly attracted external governance pressure, which forced them to change. As a result, we might find no relationship between organizational structure and measures of governance. Similarly, because all firms adjusted in a timely fashion to the optimal extent, whether voluntarily or not, there might be no relationship between depth and firm value. From all this, we can only conclude

³⁰ The entire organization becomes flatter in Rajan and Zingales (2001)—senior managers cannot risk giving lower managers too many subordinates, lest they become too independent. Hierarchies become wider, middle managers are eliminated, and the firm bifurcates into top management, who are owners/partners and can be trusted with command over many subordinates, and worker/managers, who cannot be trusted till they have served time in the firm [see Rebitzer and Taylor (1997) for an early study of the structure of law firms suggesting this pattern].

³¹ Quoted in Osterman (1996, p. 17).

that more work is needed to establish that better corporate governance has led to flatter hierarchies.

C. Information Technology

Another quite plausible explanation for the flattening of hierarchies is changes in information technology. In a classic article, Leavitt and Whisler (1958) predicted that the introduction of information technology into organizations would reduce the number of middle managers because their information gathering and coordinating role would be eliminated. Though there is some evidence that the introduction of information technology leads to smaller firms (see, for example, Brynjolfsson et al., 1994), others have argued that the introduction of information technology increases the richness of data to be analyzed and acted upon, and therefore creates more of a role for middle managers [for an excellent discussion, see Pinsonneault and Kraemer (1997)].

As recent models suggest, theoretical predictions of the effect of improvements in information technology on organizational change depend on whether information technology reduces the cost of communication or whether it increases the capability of lower managers to access information to make decisions (see Garicano, 2000). According to his theory, increases in the use of information technology increase the span of control for managers, but the effect on the depth of hierarchies is more ambiguous (predictions depend on whether the technology primarily eases communication or access to information). Thus a careful test of information-based theories requires much more detailed knowledge of the kind of work done in a position. When combined with the difficulty of obtaining good proxies on the extent of use of information technology, this leads us to think tests are again best left for future work.³²

V. Conclusion

In conclusion, we have unearthed a new set of facts about the changing nature of corporate hierarchies: firms are becoming flatter, the CEO span is broader, intermediate managers are being dispensed with, and divisional managers are getting more authority, higher pay, and greater incentive pay as they come closer to the CEO. Although our findings suggest that corporate hierarchies are becoming flatter, this phenomenon cannot be characterized simply as centralization or decentralization. On the one hand, the CEO is getting directly connected deeper down in the organization across a greater number of organizational units, a form of centralization. On the other hand, decision-making authority and incentives are also being pushed further down, a form of decentralization. We have offered a set of explanations for these facts. Testing these and other explanations offers ample scope for future work.

³² For an illustration of the difficulty in disentangling the complex relationship between IT and work practice, see Bresnahan, Brynjolfsson, and Hitt (2002).

In sum, then, this paper unearths interesting patterns of change in firm hierarchies and provides some evidence that this has to do with changes in the nature of the activities being governed. This supports a central theme in the literature stemming from Coase (1937) and Williamson (1975, 1985) and suggests that developments in that literature can offer valuable tools to understand organizational structures.

REFERENCES

- Aghion, Philippe, and Jean Tirole, "Formal and Real Authority in Organizations," *Journal of Political Economy*, 105 (1997), 1–27.
- Baker, G., M. Gibbs, and B. Holmstrom, "The Internal Economics of the Firm: Evidence from Personnel Data," *The Quarterly Journal of Economics* 109:4 (1994), 881–919.
- Bresnahan, Timothy F., Erik Brynjolfsson, and Lorin M. Hitt, "Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm-Level Evidence," *The Quarterly Journal of Economics* 117:1 (2002), 339–376.
- Brynjolfsson, Erik, Thomas W. Malone, Vijay Gurbaxani, and Ajit Kambil, "Does Information Technology Lead to Smaller Firms?" *Management Science* 40:12 (1994), 1628–1645.
- Calvo, G., and S. Wellisz, "Supervision, Loss of Control, and the Optimal Size of the Firm," *Journal of Political Economy* 87 (1978), 943–952.
- , "Hierarchy, Ability, and Income Distribution," *Journal of Political Economy* 87:5 (1979), 991–1010.
- Child, J., "Predicting and Understanding Organization Structure," *Administrative Science Quarterly* 18 (1973), 168–185.
- Coase, Ronald, "The Nature of the Firm," *Economica* 4:4 (1937), 386–405.
- Dessein, Wouter, "Authority and Communication in Organizations," *Review of Economic Studies* 69:4 (2002), 811–838.
- Feenstra, Robert C., "U.S. Imports, 1972–1994: Data and Concordances," NBER working paper no. WSS15 (1996).
- Garicano, Luis, "Hierarchies and the Organization of Knowledge in Production," *Journal of Political Economy* 108:5 (2000), 874–904.
- Gompers, Paul A., Joy L. Ishii, and Andrew Metrick, "Corporate Governance and Equity Prices," *The Quarterly Journal of Economics* 118:1 (2003), 107–155.
- Grossman, Sanford J., and Oliver D. Hart, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy* 94:4 (1986), 691–719.
- Holmstrom, Bengt, and Steven N. Kaplan, "Corporate Governance and Merger Activity in the United States: Making Sense of the 1980s and 1990s," *The Journal of Economic Perspectives* 15:2 (2001), 121–145.
- Jackall, Robert, *Moral Mazes: The World of Corporate Managers* (New York: Oxford University Press, 1988).
- Jensen, Michael C., "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review* 76 (1986), 323–329.
- Kaplan, S., "Are We All Becoming Henry Kravis Now? The Evolution of US Corporate Governance," University of Chicago working paper (1996).
- Lambert, R., Larcker, D., and Weigelt, K., 1993, "The Structure of Organizational Incentives," *Administrative Science Quarterly* 38: 438–461.
- Leavitt, H.H., and T.I. Whisler, "Management in the 1980s," *Harvard Business Review* (November–December 1958), 41–48.
- Osterman, P. *Broken Ladders: Managerial Careers in the New Economy* (New York: Oxford University Press, 1996).
- Parkinson, C. Northcote, *Parkinson's Law or the Pursuit of Progress* (London: J. Murray, 1958).
- Pinsonneault, Alain, and Kenneth L. Kraemer, "Middle Management Downsizing: An Empirical Investigation of the Impact of Information Technology," *Management Science* 43:5 (1997), 659–679.
- Powell, Walter, "Neither Market nor Hierarchy: Network Forms of Organization" (pp. 295–336), in Barry Straw and Lawrence Cummings (Eds.), *Research in Organizational Behavior* (Greenwich, CT: JAI Press, 1990).
- , "The Capitalist Firm in the Twenty-First Century: Emerging Patterns in Western Enterprise" (pp. 33–68), in Paul Di Maggio (Ed.), *The Twenty-First Century Firm* (Princeton, NJ: Princeton University Press, 2001).

Pryor, Frederic L., "The Economics of the Good Society: The Variety of Economic Arrangements," *Journal of Economic Literature* 38:3 (2000), 681–683.

Pugh, D.S., D.J. Hickson, C.R. Macdonald, K.M. Turner, C. Turner, and T. Lupton, "Dimensions of Organization Structure," *Administrative Science Quarterly* 13 (1968), 65–105.

Rajan, R.G., and L. Zingales, "The Governance of the New Enterprise" (pp. 201–227), in Xavier Vives (Ed.), *Corporate Governance, Theoretical and Empirical Perspectives* (Cambridge University Press, 2000).

——— "The Firm as a Dedicated Hierarchy: A Theory of the Origins and Growth of Firms," *The Quarterly Journal of Economics* 116:3 (2001), 805–851.

Rebitzer, John B., and L.J. Taylor, "When Knowledge Is an Asset: Explaining the Organizational Structure of Large Law Firms," MIT working paper (1997).

Roberts, John, and Eric Van den Steen, "Shareholder Interests, Human Capital Investment and Corporate Governance," Stanford GSB working paper (2000).

Rosen, Sherwin, "Authority, Control, and the Distribution of Earnings," *The Bell Journal of Economics* 13:2 (1982), 311–323.

Scott, Elizabeth D., K.C. O'Shaughnessy, and Peter Cappelli, "Management Jobs in the Insurance Industry: Organizational Deskillling and Rising Pay Inequity" (pp. 126–154), in Paul Osterman (Ed.), *Broken Ladders: Managerial Careers in the New Economy* (New York and Oxford: Oxford University Press, 1996).

Stein, Jeremy C., "Information Production and Capital Allocation: Decentralized versus Hierarchical Firms," *Journal of Finance* 57:5 (2002), 1891–1921.

Useem, M. "Corporate Restructuring and the Restructured World of Senior Management" (pp. 23–54), in *Broken Ladders: Managerial Careers in the New Economy* (New York and Oxford: Oxford University Press, 1996).

Williamson, Oliver E., "Hierarchical Control and Optimum Firm Size," *Journal of Political Economy* 75:2 (1967).

——— *Markets and Hierarchies: Analysis and Antitrust Implications* (New York: Free Press, 1975).

——— "The Modern Corporation: Origins, Evolution, Attributes," *Journal of Economic Literature* 19:4 (1981).

——— *The Economic Institutions of Capitalism* (New York: Free Press, 1985).

Wulf, Julie, "Authority, Risk, and Performance Incentives: Evidence from Division Manager Positions inside Firms," *Journal of Industrial Economics*, forthcoming (2006).

APPENDIX

Position Descriptions

1. *Chief executive officer* (CEO). The highest executive authority in the corporation. Reports to the board of directors. May also be chairman or president.
2. *Chief operating officer* (COO). The corporation's second in command, provided the person's span of responsibility is as broad or almost as broad as the chief executive's, and provided he or she has line rather than staff or advisory responsibility. This person may be the president if the chief executive officer is the chairman of the board.
3. *Chief administrative officer* (CAO). Functional head responsible for the administration of two or more major, nonrelated corporate staff functions such as finance, human resources, law, purchasing,

- data processing, public relations, and long-range planning and business development.
4. *Chief financial officer* (CFO). Functional head responsible for all financial operations of the corporation. Has responsibility for both the treasury and accounting functions. Indicate whether responsibilities also include data processing, investor relations, internal audit, and taxes.
5. *Long-range planning & business development*. Functional head responsible for developing and obtaining agreement on overall corporate strategy to enhance sales and profits. Recommends the allocation of resources to existing businesses, acquisitions of new businesses, and disposition of existing businesses.
6. *General counsel*. The head of all legal affairs of the company. Responsible for, or may be, corporate secretary; supervises outside legal counsel.
7. *Human resources*. Head of all human resources with responsibility for establishing and implementing corporation-wide policies.
8. *Chief information officer* (CIO). The highest level of operating management over the combined functions of programming, data processing, machine operation, and systems work related to data processing.
9. *Public relations*. Functional head responsible for the development and dissemination of favorable persuasive material in order to promote goodwill, develop credibility, and create a favorable public image for the company.
10. *Group chief executive* (or *group manager*). The highest authority in the group. A *group* is the highest level of multiple profit center linking the corporate CEO or COO directly to two or more single profit center units (divisions).
11. *Division chief executive* (or *divisional manager*). The highest authority in the division. A *division* is the lowest level of profit center responsibility for a business unit that engineers, manufactures, and sells its own products.

FIGURE A1.—EXAMPLE OF REPORTING LEVELS, DEPTH, SPAN, AND DESCRIPTIONS OF TYPES OF ORGANIZATIONAL UNITS

Management Position	Reporting Level	Depth	Span
Chief Executive Officer (CEO)	1		
Chief Operating Officer (COO)	2		
Group CEO	3	2	1
Divisional CEO	4		
Plant Manager	5		

Types of organizational units:

- A *corporate* unit is the highest management organization level of the parent company, responsible for its overall direction.
- A *group* is the highest-level multiple profit center linking the corporate chief executive officer or chief operating officer directly to two or more single profit center units (divisions).
- A *division* is the lowest-level profit center responsibility for a business unit that engineers, manufactures, and sells its own products.
- A *plant* is a budget or cost center whose general manager supervises manufacturing, as well as service functions, such as accounting, personnel, purchasing, and product engineering, but usually no R&D engineering. More important, the manager of a plant never has sales responsibility.