

NBER WORKING PAPER SERIES

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

Raghuram G. Rajan  
Julie Wulf

Working Paper 9633  
<http://www.nber.org/papers/w9633>

NATIONAL BUREAU OF ECONOMIC RESEARCH  
1050 Massachusetts Avenue  
Cambridge, MA 02138  
April 2003

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, the NBER Organizational Economics Conference, and the Harvard Business School Strategy Conference and our discussants George Baker, Brian Hall 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, Rajan thanks the Center for Research on Securities Prices, the Center for the Study of the State and the Economy as well as the National Science Foundation for research support. The views expressed herein are those of the authors and not necessarily those of the National Bureau of Economic Research.

©2003 by Raghuram G. Rajan and Julie Wulf. All rights reserved. Short sections of text not to exceed two paragraphs, may be quoted without explicit permission provided that full credit including ©notice, is given to the source.

The Flattening Firm: Evidence from  
Panel Data on the Changing Nature of Corporate Hierarchies  
Raghuram G. Rajan and Julie Wulf  
NBER Working Paper No. 9633  
April 2003  
JEL No. D21, D23, J3, L2

### ABSTRACT

Using a detailed database of managerial job descriptions, reporting relationships, and compensation structures in over 300 large U.S. firms we find that the number of positions reporting directly to the CEO has gone up significantly over time. We also find that the number of levels between the lowest managers with profit center responsibility (division heads) and the CEO has decreased and more of these managers are reporting directly to the CEO. Moreover, more of these managers are being appointed officers of the company. It does not seem that divisional heads are handling larger tasks making them important enough to report directly. Instead, our findings suggest that layers of intervening management are being eliminated and the CEO is coming into direct contact with more managers in the organization, even while managerial responsibility is being extended downwards. Consistent with this, we find that the elimination of the intermediate position of Chief Operating Officer accounts for a significant part (but certainly not all) of the increase in CEO reports. It is also accompanied with greater authority being given to divisional managers.

The structure of pay is also different in flatter organizations. Pay and long term incentives are becoming more like that in a partnership. Salary and bonus at lower levels are lower than in comparable positions in a tall organization, but the pay differential is steeper to the top. At the same time, employees in flatter organizations seem to have more long term pay incentives like stock and stock options offered to them.

Drawing on theories, we offer some conjectures to explain these patterns.

Raghuram Rajan  
University of Chicago  
Graduate School of Business  
1101 East 58<sup>th</sup> Street  
Chicago, IL 60637  
and NBER  
raghuram.rajan@gsb.uchicago.edu

Julie Wulf  
The Wharton School  
University of Pennsylvania  
wulf@wharton.upenn.edu

Corporations in the United States have been changing the nature of their activities. 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 and Kaplan (2001), Rajan and Zingales (2000)). How have all these changes affected the way corporations are organized?

In this paper 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 compensation structures in over 300 large U.S. firms tracked over a period of up to 14 years. Our objective is to establish some facts about changes over time in the structure of the hierarchy at senior management levels.

Our first finding is that the number of managers reporting to the Chief Executive Officer (CEO) has increased steadily over time, from an average (median) of 4.4 (4) in 1986 to 7.2 (7) in 1999.<sup>1</sup> We consider several simple explanations for the increase in CEO span of control including firm growth, addition of new positions (e.g. Chief Information Officer), and mergers. Taken together, these explanations account for only part of the trend.

---

<sup>1</sup> Others have found using smaller datasets, and focusing on particular industries, that the manager's span of control seems to be increasing (see, for example, Scott, O' Shaughnessy and 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 in 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.

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.<sup>2</sup> 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.

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 nominated “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. We find evidence of this. For instance, the Chief Operating Officer, 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. Interestingly, divisional managers are more likely to

---

<sup>2</sup> Baker, Gibbs & 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.

be appointed officers in firms that have eliminated the COO position, suggesting they inherit some of the authority of the eliminated middle layers.

Flattening of organizations, decentralization of decision-making authority, and the elimination of middle-management layers are certainly consistent with anecdotal evidence in the business press. In fact, General Electric's recent decision to break-up GE Capital into four business units is a case in point. The former chairman of GE Capital, who reported directly to the CEO, left the firm 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."<sup>3</sup> GE's organization became flatter: the CEO's span increased by 3 (the loss of the Chairman and the gain of 4 unit heads) and the average number of reporting levels between unit heads and the CEO in GE declined.

There is always a possibility that organizational structure simply is 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 positions in determining information flows, coalition formation, and the location of power. To see whether the change in organizational form has effects outside the minds of managers, we examine the structure of pay and how it changes with organizational structure.

We find that compensation in flatter organizations is closer to what we traditionally observe in a partnership, with significant pay increases associated with promotion and a greater emphasis on long-term incentives relative to short-term compensation, especially at the top. The salary and bonus levels for division managers in organizations with wider CEO span are lower in comparison to managers in similar

---

<sup>3</sup> Quote from "G.E. Is Breaking Its Largest Unit Into Four Parts", NY Times, July 27, 2002.

positions in firms with narrow span. The “prize” for promotion defined as the differential in salary and bonus between the CEO position and the division manager position divided by the number of positions separating them is higher in organizations with wider CEO span. This differential is almost double in firms with 10 or more positions reporting to the CEO as compared to those with less than 4. Finally, flatter organizations pay proportionately more in long-term incentives particularly for CEOs. The value of long-term incentives relative to salary and bonus for CEOs in firms with CEO span of 10 or greater is more than twice that in firms with span less than 4.

After establishing the facts, we discuss several broad classes of explanations for the trends. In particular, we examine whether the changes reflect aberrant managerial behavior such as agency, or whether they might be organizational responses to technological and environmental change. We find evidence consistent with the latter.

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 alluded to it (see, for example, Powell (1990), Osterman (1996), Scott, O’Shaughnessy & Cappelli (1996) and Useem (1996)). However, there is limited research that systematically characterizes the structure of hierarchies across firms and quantifies changes over time. In addition, we also provide facts on how organizational changes relate to changes in compensation. This then provides a challenging set of patterns for theories to match.

The remainder of the paper is outlined as follows. Section 1 describes the data, Section 2 establishes the facts, and Section 3 considers the facts in light of several theories. A brief conclusion follows.

## 1. Data Description

Empirical work on the organizational structure of firms is relatively 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 datasets of a single firm (e.g. personnel records in Baker, Gibbs & Holmstrom, 1994) or less detailed data on a smaller sample of firms (e.g. compensation survey data of 11 insurance firms in Scott, O'Shaughnessy & Cappelli, 1996).<sup>4</sup> As alluded to earlier, these studies typically infer the number of levels in the hierarchy from promotions between positions or define span of control in terms of ratios of the number of employees at different organizational levels. By contrast, the primary dataset used in this study includes a panel of more than 300 publicly traded U.S. firms over the years 1986-1999, 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. 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

---

<sup>4</sup> There are several early empirical papers on organizational structure using cross-sectional techniques (e.g. Child (1973) and Pugh, Hickson, Macdonald, Turner, Turner and Lupton (1968)).

positions including both operational positions (e.g. Chief Operations Officer and Divisional CEO) and staff positions (e.g. Chief Financial Officer and Head of Human Resources).<sup>5</sup> The survey typically covers all the positions at the top of the hierarchy and a sample of positions lower down. An observation in the dataset 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 (e.g. 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: job title, number of employees under the position's jurisdiction, the title of the position that the job reports to (i.e. 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 consultants are knowledgeable about survey participants because they are assigned to client teams and typically work with specific clients for several years. Moreover, while the participating firms initially match their positions to the benchmark positions in the survey, the consultant follows up to verify accuracy and spends an additional 8-10 hours on each questionnaire evaluating the consistency of responses with public data (e.g. proxy statements) and across years.<sup>6</sup> Potentially of more importance, participants have an incentive to match positions correctly and provide accurate data because they use the survey results to set pay levels and design management compensation programs.

---

<sup>5</sup> In this study we use a subset of the survey's benchmark positions: position descriptions are listed in the Appendix.

<sup>6</sup>For example, a first-time participating firm reads the position descriptions and is shown examples like the one in figure 1 in order to match their positions to those covered in the survey.

In Table 1, we present descriptive statistics for the firms in the sample. While the dataset 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 14-year period (balanced). The firms in the sample are large, well established and profitable with average size of approximately 47500 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).

Our study focuses on two measures of organizational structure: the breadth and depth of the hierarchy. Breadth is represented by the Chief Executive Officer's span of control (CEO Span) and is defined as the number of positions reporting to the CEO. Since we know the title of the position that each position reports to (i.e. the position's boss), we can determine the positions which report directly to the CEO.<sup>7</sup> 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

---

<sup>7</sup> Since the survey is based on benchmark jobs, it is possible that non-standard positions are excluded from the survey. Companies may differ systematically as to the percentage of management positions that are benchmark jobs and this might bias our measure of span. However, since the positions reporting to the CEO are the most senior positions and the primary focus of the survey, we expect the bias to be minimal.

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 1 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 Chief Operating Officer, Group CEO, 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. The definition of plant managers is not consistent across industries, especially when one moves from manufacturing to service firms.

The survey data are supplemented with information from several other datasets (Compustat for financial and segment information, Compustat's Execucomp for data on CEO tenure, Securities Data Company for mergers, Spectrum for institutional shareholdings, and Directory of Corporate Affiliations for year of founding). While the survey is conducted in April of each year and the organizational data describe the firm in

the year of survey completion, some statistics (e.g. number of employees in a division) represent the end of the most recent fiscal year. To maintain consistency, we match the supplemental datasets using the year prior to the year of the survey. Finally, not all variables are available for all positions, firms and years, and due to limitations in matching with the supplemental datasets, our samples are smaller for some parts of the analysis.

## **2. The Facts**

### **2.1. Increasing Span**

Having described the data and its 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 moves over the period. The number of positions reporting has gone up from a mean (median) of 4.46 (4) in 1986 to 6.70 (6) in 1999, an increase of about 50 percent. One might worry that some of the change is induced by changes in the firms that are in our sample over time. If we restrict ourselves to the 51 firms that appear throughout the 14 years of our panel, the change is even more dramatic. From a mean (median) of 4.39 (4) it goes up to 7.16 (7), an increase of 63 percent.

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 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 86000 in 1986 to 70000 in 1999 (see Table 1 a). In the unbalanced panel, the size of firms is constant over time – approximately 47500 in both 1986 and 1999. 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).

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 a significant acquisition(s) (amounting to more than 20% percent of assets in any year) in the previous 3 years. CEO reports still increase from 4.4 in 1986 to 7.0 in 1999. 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 6.6 in 1999.

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 4.8 in 1999 (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.<sup>8</sup>

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

---

<sup>8</sup> 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 number of CEO reports on (the logarithm of) the number of employees, the HHI measure 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.

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.<sup>9</sup> In Table 3, we report for the balanced panel the average number of direct reports to the CEO of a particular position. Each CEO had, on average, 0.02 CIOs and 0.37 HHRs reporting in 1986. By 1999, each CEO had 0.18 CIOs and 0.69 HHRs reporting to them. Thus these two positions account for only about 0.5 of the increased reports to the CEO. Where do the rest of the reports (equal approximately to  $7.16 - 4.39 - 0.5 = 2.27$ ) 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 1.49 in 1999 (see Table 3). The number of division managers reporting directly to the CEO went up from 0.21 in 1986 to 0.66 in 1999. Thus the increase in direct reports from positions traditionally lower down in the organization accounts for approximately 40% of what is unaccounted for (0.91 of 2.27).<sup>10</sup>

---

<sup>9</sup> Chief Information Officer (CIO or 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 or position #7 in the appendix) is defined as the head of all human resources with responsibility for establishing and implementing corporate-wide policies.

<sup>10</sup> Some functions have increased considerably in importance. Only 0.2 public relations officers reported to the CEO in 1986, now it is 0.51. By contrast, strategic planning has not increased in importance: On average, only 0.27 planning officers reported to the CEO both in 1986 and 1999. Corporate Research and

The number of divisional manager positions reported by survey participants has increased over time.<sup>11</sup> 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 (but declined to 0.46 in 1999). The probability that a divisional manager reports to the CEO consistently trended upwards over the period from 0.05 in 1986 to 0.31 in 1998 (and 0.19 in 1999).

Parenthetically, some traditionally senior positions have also become closer to the CEO. While 67 percent of CFOs reported to the CEO in 1986, 88 percent report in 1999. A similar pattern is seen for the General Counsel. Law and Finance seem to have become more important!

## **2.2. 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 4 b 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 1.58 in 1986 to 1.15 in 1999, approximately 27 percent. Interestingly, the correlation between CEO Span and Depth is significantly negative (correlation =  $-.27$  for the whole sample). Wider organizations are also less tall, or put in a time series context, organizations are becoming flatter.

---

Development and Manufacturing positions account for approximately 0.20 of the remaining increase in the number of CEO reports.

<sup>11</sup>The average number of divisional manager positions per firm reported in the survey has increased from 4.6 in 1986 to 6.9 in 1999 for the balanced sample.

Perhaps then the increasing number of reports to the CEO reflects increasing centralization: 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 6000 employees in 1986 to 3600 employees in 1999 (see Table 4 b, 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 terms of the number of divisional manager positions reported but not in terms of the fraction of the firm covered. For the constant sample, we calculate the ratio of total number of employees under divisional manager positions sampled by the survey to the total number of employees in the firm. As Table 4 b indicates, this ratio was 0.42 in 1986 and 0.4 in 1999. The coverage of the survey has not changed significantly.<sup>12</sup>

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

---

<sup>12</sup> A similar conclusion is reached if one examines the coverage of group positions reported (results available on request from the authors).

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 regressed attributes of the position (whether it reports to the CEO, what its depth is) against the size of the firm, the size of the division, a time trend, and an indicator for the position. A significant coefficient estimate for the trend would suggest that keeping the other attributes of a position relatively constant, its place on the organizational totem pole did change.

The regression estimates are reported in Table 5. The standard errors for the reported estimates are clustered at the divisional manager position level (the errors can also be clustered at the firm level – we focus on coefficients that are significant regardless of the method of clustering). In column (i), the dependent variable is the depth of the position. We find a significant negative coefficient for the trend, that is, depth decreases significantly over time. In column (ii), the dependent variable is 1 if the position reports to the CEO directly and zero otherwise. We find that the probability of reporting to the CEO increases over time. Also, the number of employees under a particular divisional manager position trends downwards very slowly (about 1 percent 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.<sup>13</sup> In column (iii) of Table 5, the dependent variable is whether the divisional manager is also designated an officer. The significant positive coefficient estimate suggests that a divisional manager position has become significantly more likely to be designated an officer over time. Authority and responsibility are indeed moving further down.

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. On the other hand, decision-making authority is also being pushed further down, a form of decentralization or using the jargon, "empowerment".

### **2.3. "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 without the level of detail our data set offers on reporting relationships – simply because positions disappear does not mean that reporting has become more direct, for other positions could insinuate themselves in the middle.<sup>14</sup>

---

<sup>13</sup> The term "officer" is defined by both the Internal Revenue Service in Section 280G and the Securities and Exchange Commission in Section 240.16 (rules governing insider trading). The IRS code states that "whether an individual is an officer with respect to a corporation is determined upon the basis of all the facts and circumstances in the particular case (such as the source of the individual's authority, the term for which the individual is elected or appointed, and the nature and extent of the individual's duties)." Section 240.16(f) of the Securities and Exchange Commission Act of 1934 defines an officer 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."

<sup>14</sup> 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.

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 Chief Operating Officer (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 reports 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), a trend, and firm indicators. The trend is significantly positive. CEO Span increases, on average, by about 0.17 every year. Interestingly, the coefficient on firm size is negative. Since we include firm fixed effects, this suggests growing firms seem to decrease span once we correct for the trend. In column (ii), we also include an indicator for whether the firm has a COO and another indicator if it has a CAO. The coefficient on the time trend falls slightly. Interestingly, the coefficient on the presence of a COO is negative, statistically significant, and large (-1.06). Assuming the COO always reports to the CEO, this coefficient suggests her presence reduces the number of CEO reports because an average

of 2.06 managers who would otherwise report to the CEO now report to her. In other words, the COO is truly an intermediary.<sup>15</sup>

Columns (iii) and (iv) suggest the presence of intermediaries like the COO and the CAO unambiguously 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. This is consistent with Calvo and Wellisz (1978) who emphasize that growth takes place by adding layers in a hierarchy.

While the coefficient on the trend falls when we include indicators for the presence of these positions, it does 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.

Finally, one might wonder if the elimination of intermediary positions is purely a form of centralization. It is not. The likelihood of a divisional manager being appointed an officer increases when a firm drops its COO. If we estimate the same specification as in Table 5 (iii) with an indicator for firm years in which a firm has a COO, we find a negative coefficient on the indicator (-.024) with a t-statistic of 2.29. Thus, the probability of a division manager being an officer increases when a COO is dropped by about 2.5% (compared to an average probability in 1986 of 20%). This suggests that the

---

<sup>15</sup> By contrast, the presence of a CAO increases CEO reports, but by less than 1. Since the CAO also typically reports directly to the CEO, the coefficient estimate of 0.342 suggests that the CAO also intermediates between lower positions and the CEO, but typically fewer than the COO.

CEO does not usurp all the authority of the eliminated intermediary. Instead, some of it devolves to the divisional manager.

#### **2.4. 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. But 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.

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. The first question we have is whether divisional managers in flatter organizations are paid more or less than their counterparts in steeper organizations.

In Table 7, we report how various attributes of the pay structure for firms vary as span increases. The first aspect of pay we consider is the divisional manager’s salary and bonus. This increases with increasing span, from a median of \$ 225950 for a firm with CEO Span of between 1-3 to \$ 322100 for firms with CEO Span of 10 and above (Table 7 a). Of course, these raw numbers will need to be corrected to draw any inferences. For instance, since span increases over time, the pattern we report could be explained simply by inflation.

Next, we compute the steepness of pay, which is the difference between the salary and bonus of the CEO and the salary and bonus of the divisional manager divided by the

salary and bonus of the divisional manager *and one plus the depth* of the divisional manager. This therefore represents the fractional change in pay per unit of depth. Again, this increases with increasing span, increasing from a median of 1.37 for firms with CEO reports of 1-3 to 2.28 for firms with CEO reports of 10 and above. Even if we consider divisional managers at depth 1 only, median steepness increases from 1.40 to 2.28 as span increases.

Finally, we compute the ratio of the value of long term incentive pay to the value of salary and bonus (typically stock and stock options), both for divisional managers and for CEOs.<sup>16</sup> Median long-term incentive pay for divisional managers goes up from 0.32 to 0.58. For CEOs, median long-term incentive pay goes up from 0.59 to 1.36. Thus there seems to be more long-term incentive pay as CEO span goes up, and it is proportionally more at the top. Employees do seem to be treated more like owners in organizations that have larger CEO span.

Pay levels and, potentially, incentives have changed over time. Further, it is well known that they change with the size of the firm as well as the division being managed. So to really tease out the effect of organizational change on pay, we need to correct for time effects (to correct for factors such as inflation), and the size of the firm and division.

In the first column of Table 8, we report OLS estimates from a regression of the log of divisional manager's pay against the log of the firm's size, the log of the division's size, CEO Span, the position's depth (DEPTH) and year indicators. The standard errors

---

<sup>16</sup> The value of long-term incentive pay is computed by Hewitt. Stock options are valued using a modified version of Black-Scholes 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 Black-Scholes that takes into account vesting, term provisions, and the probability of achieving performance goals.

are estimated by clustering on the position. The negative coefficient on DEPTH indicates that positions that are more distant from the CEO are paid less – this suggests that hierarchical position does matter, at least in terms of how the organization rewards the occupant. The negative coefficient on CEO Span indicates that once we control for inflation, organizational size and position depth, divisional manager pay levels in firms with greater span are actually lower. Based on the OLS regression in column (i), a one standard deviation increase in CEO Span is accompanied by a decrease in divisional manager pay by approximately 3.2%.<sup>17</sup>

Next we investigate whether the correlation between pay levels for a position and the structure of the organization within which it is located are driven by organizational changes over time or by differences between pay patterns of different organizations at a point in time. In other words, do organizations that are becoming flatter start paying less or do organizations that are flatter to begin with pay less? The OLS estimate does not allow us to answer this question.

Therefore, we also compute the fixed effects estimate by including an indicator for the position (column (ii)) and the between estimate by averaging data for a position across all years that the position is reported and then estimating coefficients (column (iii)). The negative coefficient estimates for CEO Span for both regressions suggest both that increases in a firm's span over time are correlated with decreases in pay levels for a position and also firms with greater span pay less for a position.<sup>18</sup>

Moving to steepness of pay, we find that pay profiles from divisional manager to CEO become steeper both for firms that are increasing their span and for firms with

---

<sup>17</sup> As a comparison, a one standard deviation increase in depth reduces pay by 11.4%.

<sup>18</sup> It may be that pay levels in a hierarchy do not depend as much on the vertical distance from the top, but on the total number of people in the layers above one's own.

greater span. The coefficient estimate for the fixed effect regression suggests, for example, that a one standard deviation increase in span is accompanied by an increase in steepness by 11.4 % of its mean. To dispel doubts about whether this result is an artifact of how steepness is computed, we also estimate the regression restricting it to divisional managers at depth 1 (coefficient estimates not reported). CEO span is again positively and significantly correlated with steepness (though because of the reduced number of observations, our estimates are less precise and we lose significance in the fixed effects regression).

Moving to divisional manager long-term incentive pay, it does appear higher for firms with greater span. But the small and statistically insignificant fixed effects estimate suggests that changes in firm span over time are not associated with more long term incentive pay for divisional managers. Instead, the significant “between” estimate suggests firms that, on average, have higher span tend to offer managers more long-term incentive pay (a one standard deviation increase in CEO span is accompanied by an 8.3% increase in the divisional manager’s long term incentives relative to their mean).

Finally, long-term pay incentives for the CEO are stronger in organizations with high SPAN (columns (x)-(xii)). The OLS coefficient estimate in column (x) suggests a one standard deviation increase in CEO span is associated with an 8% increase in long-term incentives at the CEO level.

All this suggests that as organizations are becoming flatter, and even as more responsibility is being hived off to lower levels, pay and incentives are becoming more like that in a partnership. Salary and bonus at low levels in flatter firms are lower than in comparable positions in a tall organization, but the pay differential is steeper to the top.

At the same time, flatter organizations seem to have more long term pay incentives like stock and stock options associated with them. Let us now try and make sense of these facts on organization structure and pay using the theory.

### **3. Making Sense of the Facts**

Our main purpose in this paper is to outline the facts on organizational change. There is not enough space to do an exhaustive job identifying what might account for the change. Nevertheless, two broad classes of explanation stand out. The first is that the trend reflects past or present aberrations in managerial behavior. The second is that it is a response to changes in technology and the environment.

#### **3.1. Aberrant Managerial Behavior or Agency**

Managers focus on maximizing their own utility and only indirectly on maximizing the firm's value. Perhaps the trends we observe can be attributed to agency. However, since there are so many ways managers may fail to maximize firm value, we can ascribe the observed trends in organizational structure both to the decline of one kind of agency problem (empire building) and to the increase of another (entrenchment).

Let us start with empire building. According to this, in the past top management expanded its turf and sense of worth (see, for example, Jensen (1986), Jackall (1988), Osterman (1996), Parkinson (1958), and Useem (1996)) by hiring legions of useless middle managers. Equivalently, because governance was poor, firms did not fire incompetent managers but simply hired new ones to take their place.

If firms had tall, overstaffed, hierarchies because of empire building, improvements in corporate governance could explain the trend towards 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”.<sup>19</sup> 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.

One crude proxy for the extent of governance pressure on a firm is thus the extent of institutional shareholding in that firm. In Table 9 columns (i)-(ii), we present regressions with Depth as the dependent variable and the log of firm size, a time trend, and the lagged percent of shares held by institutions in the firm as explanatory variables. We present both fixed effects and between regressions. The empire building theory implies that increases in institutional holding put more pressure on management and forced them to get rid of layers of managers so we would expect a strong negative correlation between lagged institutional shareholding and Depth in the fixed effects regression. Contrary to the theory, we find there is no significant relationship.

Of course, there is very little consensus in the finance literature on what might be a good measure of governance. So maybe the fault is with the measure and our tests may have weak power. Another measure of the strength of outside governance that has received recent interest is the Governance index compiled by Gompers, Ishii, and Metrick (2002). Using various publications of the Investor Responsibility and Research Center they track a number of corporate governance provisions adopted by firms. They supplement it with takeover law provisions from the state in which a firm is

---

<sup>19</sup> Quoted in Osterman (1996, p17).

headquartered to obtain a “Governance Index”, which proxies for the extent of power managers have over shareholders.

When we include the Governance Index as an explanatory variable (higher the index, greater the power of managers), we find a positive correlation with Depth in the between regressions but no relationship in the fixed effects regressions. Because the Governance Index varies fairly slowly, there might be too little variation over time to be able to estimate the fixed effects precisely. Nevertheless, the between estimate suggests that more powerful managers are in organizations with a greater number of layers.

However, it would be premature to conclude that empire building explains the trend. For one, we have some indication of a correlation only in the cross-section (firms with more powerful managers have more layers) but none in the time series (there is no indication that as external governance weakens, managers add layers). Moreover, our explanatory variables are not exogenous – even though the slow moving Governance index contains a number of provisions that are not determined by the firm but by state laws. We need more evidence to be convinced that empire building is a significant concern.

One piece of evidence that would be convincing is if we see some adverse effect on the market values of those firms that are ostensibly empire builders. If high depth is a symptom of empire building, we should see a negative relationship between Depth and the market to book ratio. In a regression of a firm’s market to book 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. We find no relationship again in the between estimates. From all

this, it is hard to conclude that there is a prima facie case for the decline in empire building as an explanation for the observed trend.

An alternative interpretation is that the change in firm hierarchies reflects increasing entrenchment (see Shleifer and Vishny (1989) for an early formal treatment of entrenchment): CEOs drop potential successors like COOs, and have more managers reporting directly to them, in order to make themselves harder to replace. The impetus for this is precisely the increasing scrutiny of outside investors, which has made top jobs more precarious in recent times (see Huson, Parrino, and Starks (2001) who find that CEO tenure has fallen in recent years). Of course, greater outside scrutiny only implies that CEOs have a greater incentive to change organizational form to entrench themselves. However, outside investors also have a greater ability to thwart entrenchment. So for entrenchment to be a valid explanation of the trend, it must be that the perverse incentives generated by outside monitoring outweigh the monitors' ability to counter this behavior.

If CEOs are in fact entrenching themselves, for instance by getting rid of their COOs or by having more people reporting to them, we should see that such CEOs survive longer in their jobs. We obtain data on when a particular CEO assumed office, when they left, and their age, from Compustat's Execucomp.

We estimate whether the likelihood of a CEO leaving the firm declines in the years subsequent to the one in which a COO is dropped. In Table 10 column (i), we present the results of a Cox proportional hazard model where the model is estimated from data on the number of years a CEO stays in office. We want to estimate the effect of a time-varying dummy variable No COO which equals one in the years following the one in which the firm drops its COO and zero otherwise. The reported estimate indicates a

hazard ratio of 0.53, which is statistically significant. This means that the hazard function for CEO departures is halved once the COO is dropped. Another way of expressing this is that the expected survival time of a CEO is longer once a COO is dropped.

Of course, some CEOs will retire when they get older, and some companies have a mandatory retirement age. We include an indicator if the CEO is age 65 or above (Retiredum in column (ii)). Such CEOs are indeed less likely to survive in their jobs, but even correcting for this and despite the loss of observations, we find the probability of a CEO leaving is still significantly lower when a COO is dropped.

Before we can conclude that we have prima-facie evidence of entrenchment, we have to recognize that the nature of a CEO and his power affect whether a COO is dropped. These qualities are also likely to determine the CEO's survival rate, independent of whether dropping a COO has any effect by itself. For instance, an extremely hard-working CEO is likely to find she does not need a COO, but her ability to work hard is likely to make her survive longer. Dropping a COO will be correlated with the length of the CEO's tenure but only because a common omitted variable, the CEO's workaholic nature, drives both.

One way to avoid this problem is to look at the survival rate of successor CEOs: Do CEOs whose predecessor dropped his COO survive longer? We include an indicator for CEOs whose predecessor dropped their COO (see Table 10, columns (iii)-(iv)). We

find these successor CEOs also survive longer.<sup>20</sup> So there may indeed be reason to believe that CEOs last longer in flatter organizations.<sup>21</sup>

But does the explanation hold up if we delve deeper? To broadly explain the trend, and to be consistent with the view that entrenchment has been a response to increasing external scrutiny, we should see evidence of greater entrenchment (i.e. wider span) in firms with greater outside scrutiny. In Table 9, columns (iii-iv), we present regressions with CEO Span as the dependent variable and the log of firm size, a time trend, and the lagged percent of shares held by institutions in the firm as explanatory variables. The correlation is not significant in the fixed effects regression and has the opposite sign to that expected. It is significant at the 10 percent level in the between regressions and has the expected positive sign. When we replace the lagged percent held by institutions with the Governance Index (lower index implies stronger governance), we find no relationship in the fixed effects but now a significant positive correlation in the between estimates. Firms with weaker external governance have a wider CEO Span. This seems at odds with the estimate using institutional shareholding as a measure of external governance, and at odds with the entrenchment explanation, which would suggest exactly the opposite.<sup>22</sup>

Neither decreasing empire building nor increasing entrenchment by top management would explain the devolution of power to divisional managers. Empire

---

<sup>20</sup> We still may have a potential problem. Only weak boards may acquiesce in the COO being fired, and those boards may allow existing CEOs longer tenure. However, this explanation relies on the firing of COOs to be contrary to the interests of the firm, and thus is not really that far from entrenchment.

<sup>21</sup> Is the greater survival of CEOs in organizations without COOs because CEOs arrive in the job earlier (without having to serve an apprenticeship as COO)? The correlation between whether an organization has a COO and the age of the CEO on entry is 0.13 suggesting a weakly positive correlation (p-value=.08). We have too few observations to estimate precise coefficient estimates in a regression.

<sup>22</sup> Of course, it may be that managers entrench when there is weaker outside governance. But then the overall trend cannot be attributed to improving governance in the last two decades.

builders are wasteful in their investments and staffing, but do not necessarily retain excessive power in their own hands (so devolution is hard to explain). By contrast, entrenchers tend to concentrate power in their hands, so growing entrenchment also does not sit well with growing decentralization.

In sum then, while the agency explanation is a priori a plausible one, a preliminary analysis suggests the support for it in the data is, at best, weak. Weak enough, that is, for us to look elsewhere.

### **3.2. Responses to Environmental and Technological Change**

An alternative class of explanations is that the change in organizational form is an appropriate (and not aberrant) response to external change. Perhaps improving corporate governance is not the primary external impetus for organizational change. Instead, perhaps it is partly the evident increase in the amount of competition faced by large firms, both as a consequence of increased international trade, and because of deregulation and new entry. Improvements in capital markets have also contributed directly to the increase in competition as new entrants find financing easier to obtain. This has also provided employees more outside options including entrepreneurship.

These environmental trends may have changed the nature of delegation in the organization. They may also have changed the ability of top management to exercise control. Let us explore these further.

#### *Competition, Empowerment, and Incentives.*

Competition increases the pace of change, the need for new products and services, and consequently, for initiative and innovation. Employees have to be given more autonomy so that they can respond more quickly to change (see, for example, Dessein

(2002), Prendergast (2002), Rajan and Zingales (2000)). Autonomy may itself be a source of incentive. The presence of senior management overseeing every move can destroy incentives to innovate (see, for example, Aghion and Tirole (1997)), while the necessity of having decisions approved by higher authorities can make it hard for employees to acquire or use the soft information necessary for customization (Stein (2002)). However, autonomous employees are harder to control. One way to make sure they have the right incentives despite the autonomy is to offer incentive pay that is linked to firm performance (Williamson (1985), Wulf (2002)).<sup>23</sup> Along these lines, Prendergast (2002) argues that since it is more difficult to assign tasks in volatile businesses, firms are more likely to delegate responsibility to managers. But, to shape managerial discretion appropriately, firms will link pay to long-term performance.

A specific implication of this line of reasoning is that authority should be delegated more in the businesses that have become most volatile. Furthermore, divisional managers who are delegated the authority should have higher long-term incentive pay.

Our measure of responsibility is whether the incumbent in a division manager position is a corporate officer of the firm (OFFICER). For the underlying volatility or risk of the division's business, we use the volatility of quarterly earnings in the division's industry defined as the average standard deviation of EBITDA/Sales for the 20 previous quarters for firms in the same 3 digit SIC code.

We estimate a two stage least squares regression. In the first stage, the dependent variable is whether the divisional manager is an officer. The explanatory variables are the volatility of the division's business, the relative size of the division (size of division/size

---

<sup>23</sup> The view of the firm as an incentive system has been emphasized by Holmstrom and Milgrom (1994) and Holmstrom (1999).

of firm, under the assumption that the position is more likely to be an officer if its relative size is higher), the size of the firm, and year indicators. In the second stage, the dependent variable is the ratio of the divisional manager's long-term incentive pay to total pay. The explanatory variables are firm size and year indicators. The coefficient estimates for the first stage are in Table 11 column (i) and the estimates for the second stage are in Table 11 column (ii).

The first stage estimates indicate that managers of divisions with higher volatility are indeed more likely to be appointed officers. A one standard deviation increase in business volatility increases the probability that the divisional manager will be an officer by 7.6%. The second stage estimate indicates that a divisional manager who is an officer gets significantly more long-term incentives as a fraction of bonus and base pay than a divisional manager who is not one. A one standard deviation increase in the officer indicator increases long-term incentives as a fraction of bonus and base pay by 31.5% of the mean.<sup>24</sup>

In sum then, the elimination of middle management so as to delegate authority, combined with increases in incentive pay, may indeed be responses to the competitive environment. The elimination of layers of middle management allows more authority to be given to divisional managers. At the same time, these managers get more long-term incentives so as to keep them on the straight and narrow.

The immediate question then is whether the CEO is performing a useful role at all? Is he being overburdened with reports purely as a commitment to avoid detailed oversight or interference in their activities? Two facts suggest otherwise. First, in our

---

<sup>24</sup> When we use only divisional volatility as an instrument, the coefficient on division volatility is positive and significant in the first stage. While the coefficient on officer is positive in the second stage, it is not significant (t-stat=0.99).

sample, and as is well known, CEO pay, especially the component related to long-term incentives, exploded during the 1990s. While it is probably incorrect to ascribe all of this explosion to actual value provided by the CEO, it seems hard to maintain that they were being paid more even as their work was becoming less valuable. Second, we re-estimate the regressions in Table 8 columns (i)-(iii) and (vii)-(ix) but including an indicator variable for whether the divisional manager reports directly to the CEO (coefficient estimates available from authors).

Divisional managers that report directly to the CEO have significantly greater base pay and bonus. The evidence on long-term incentives is more mixed (the coefficient estimates in the OLS and Between regressions are insignificant while the coefficient estimate in the Fixed Effects regression is only mildly positive ( $t=1.7$ )). By contrast, divisional managers who are appointed officers have significantly greater base pay and bonus as well as greater long-term incentives than other divisional managers. This suggests that the CEO may be substituting for long-term incentive pay by monitoring direct reports, and thus continues to play a key role. While indeed he may be moving to handling exceptions for his many reports rather than providing constant oversight, it would be premature to conclude that his position will become redundant any time soon.

#### *Increasing Importance of Human Capital*

As the talents of lower level employees become more needed to thwart competition, and as physical or financial capital becomes more readily available, the firm's top management may find it harder to exercise formal authority in the old ways. According to the Property Rights theory of Grossman, Hart, and Moore (1986, 1990), top management obtains power over its employees because it has control rights over the

firm's critical physical assets. Rajan and Zingales (1998, 2001) argue that it is better to view alienable assets as just one (though perhaps the most important historically) of the critical resources firms can be built around.<sup>25</sup> Rajan and Zingales (2001) show that when a firm can fully appropriate the value of its critical resources – as, for example, when they are alienable physical assets -- hierarchies tend to be tall and narrow. Managers are paid according to their positional power, for example, based on the number of subordinates they command.

When, however, a firm does not have critical assets it can own – as, for example, when value resides in the talent of line employees or in client relationships – it cannot risk giving lower managers too much positional power. 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 or access to clients 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).

The wages of low-level managers in these flat firms are lower because they do not enjoy the positional power that their counterparts in tall firms enjoy. But wage profiles going up the hierarchy are much steeper. In addition, managers get substantial ownership rights, especially at the top, giving managers an incentive to stay with the firm despite having many competitors for the top positions. In other words, if the competitive environment and the ready availability of finance make human capital more important,

---

<sup>25</sup> There is therefore a link between the Property Rights view of Grossman, Hart and Moore, and the Resource Based view of the firm (for example, Wernerfelt (1984)).

we should see a flattening of organizations, and an increase in long term incentives, especially at the top.

A specific implication of Rajan and Zingales' development of the property rights literature is that firms that are more physical capital intensive should have a narrower, deeper, hierarchy. One measure of the physical capital intensity of a firm is the real value of fixed assets per employee (RFASSEMP). While crude, one fact suggests it captures what we intend it to capture: a measure of whether human capital is important in a firm is whether the head of human resources reports directly to the CEO (another measure would be her salary). When we regress an indicator as to whether the head of human resources reports directly against firm size, a trend, and RFASSEMP, we get a reassuring negative and strongly significant coefficient estimate for RFASSEMP.

In Table 12 column (i), we include this measure along with the other explanatory variables and firm fixed effects. We find that CEO Span is significantly negatively correlated with the RFASSEMP. The magnitude is also large. A one standard deviation increase in RFASSEMP is associated with a decrease in CEO Span by 0.60, which is approximately 11% of the mean of 5.29 (Table 2). The estimates in column (iii) indicate that RFASSEMP is also positively and significantly correlated with Depth (though only in the fixed effects estimate and not in the between estimate). Thus as firms become less physical capital intensive, they are becoming flatter.

A more detailed prediction of the theory is that as firms become more human-capital-intensive they will pay less for positional power – as measured by the number of people under a position. If we estimate the fixed effect regression in Table 8 (ii) including RFASSEMP and the interaction between RFASSEMP and the number of employees

under the manager, we find a positive and significant coefficient on the interaction term (estimates available from the authors). Physical-capital-intensive firms do pay more for positional power. A one standard deviation increase in the interaction term is associated with an increase in pay of 8.2 percent, though the statistical strength of the empirical finding is not overwhelming (the coefficient is significant at only the 10 percent level).

In sum then, our preliminary analysis suggests that perhaps the changes in organizational structure have something to do with the need for incentives as external competition has increased and the changing nature of control. This is certainly a fruitful direction to pursue in further investigations.

### **3.3. Other Theories**

So much has been changing over the last two decades that it would be cavalier to propose a “one-stop” explanation. Here are two other important explanations.

#### *Changing 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. While there is some evidence that the introduction of information technology leads to smaller firms (see, for example, Brynjolfsson, Malone, Gurbaxani, and Kambil (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)).

Moreover, as recent models suggest, the predictions 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, we think tests are best left for future work.<sup>26</sup>

### *Fads*

Perhaps the entire phenomenon is a fad, driven by the pressure on managers to do something new, and the willingness of consultants to give them what they want. Even if some organizational change may indeed be blind imitation of others or simple-minded obedience of the diktats of gurus, that we see some systematic characteristics of firms associated with these changes suggests something other than unthinking follow-the-leader behavior is at work. However, more work is clearly needed here also.

## **Conclusion**

In sum then, we have unearthed a set of facts about the changing nature of corporate hierarchies. The CEO's span of control is increasing even while the number of layers separating managers from the CEO is decreasing, and authority is being pushed further down the organization. Furthermore, as organizations are becoming flatter, salary and bonus profiles across the hierarchy are becoming steeper, and long-term incentive pay is spreading through the organization. While there has been work suggesting some of

---

<sup>26</sup> For an illustration of the difficulty in disentangling the complex relationship between IT and work practice, see Bresnahan, Brynjolfson, and Hitt (2002).

these facts, and while some facts have been widely hinted at in the business press, the nature of our data enables us to establish the widely known facts more firmly and add new ones.<sup>27</sup>

We have also listed a set of theories that might account for the facts. While no single theory is fully persuasive as yet, nevertheless it is plausible that as firms are facing more competition and becoming less physical capital intensive, their organizational structure and pay patterns look more like those in partnerships – flatter organizations, with a period of apprenticeship at lower salary and bonus, large pay increases with promotion, and a significant use of long term incentives like stock options and stock.<sup>28</sup> Establishing the extent of explanatory power of the theories is a task for future work.

---

<sup>27</sup> Scott, O’ Shaughnessy and Cappelli (1996), Useem (1996).

<sup>28</sup> See Scott (1965) for an early account of why professional organizations may have this character.

## References

- Aghion, Philippe and Tirole, Jean. 1997. "Formal and Real Authority in Organizations" *Journal of Political Economy*, Vol. 105(1). p 1-29.
- Baker, G., Gibbs, M. and Holmstrom, B. 1994. "The Internal Economics of the Firm: Evidence from Personnel Data" *The Quarterly Journal of Economics*. Vol. 109 (4). pp. 881-919.
- Bresnahan, Timothy F; Brynjolfsson, Erik; Hitt, Lorin M. Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm-Level Evidence. *The Quarterly Journal of Economics*. Vol. 117 (1). p 339-76. February 2002.
- Brynjolfsson, Erik, Malone, Thomas W., Gurbaxani, Vijay, and Kambil, Ajit. 1994. "Does Information Technology Lead to Smaller Firms?" *Management Science*, Vol. 40, Iss. 12. pp. 1628, 17 pgs.
- Calvo, G. and S. Wellisz. 1978. "Supervision, Loss of Control, and the Optimal Size of the Firm" *Journal of Political Economy* (87), pp. 943-952
- Child, J. 1973. "Predicting and Understanding Organization Structure" *Administrative Science Quarterly* (18), pp. 168-185.
- Dessein, Wouter (2002) "Authority and Communication in Organizations", *Review of Economic Studies*, Vol 69 (4), 811-838.
- Garicano, Luis. 2000. "Hierarchies and the Organization of Knowledge in Production" *Journal of Political Economy*, Vol. 108(5). p 874-904.
- Gompers, Paul A., Ishii, Joy L. and Metrick, Andrew, 2002, "Corporate Governance and Equity Prices," *The Quarterly Journal of Economics*, forthcoming (Feb. 2003)
- Grossman, Sanford J and Hart, Oliver D. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration" *Journal of Political Economy*. Vol. 94 (4). p 691-719.
- Hart, Oliver and Moore, John. 1990. "Property Rights and the Nature of the Firm" *Journal of Political Economy*, Vol. 98(6). pp. 1119-58.
- Holmstrom, B. and Kaplan, S. N. 2001. "Corporate Governance and Merger Activity in the United States: Making Sense of the 1980s and 1990s" *Journal of Economic Perspectives*, Vol. 15(2). pp. 121-44.
- Holmstrom, Bengt, 1999, "The Firm as a Subeconomy", *Journal of Law, Economics and Organization*, 15, 74-102.

- Holmstrom, Bengt and Paul Milgrom, 1994, "The Firm as an Incentive System" *American Economic Review*, 84, 972-991.
- M. Huson, R.Parrino, and L. Starks, "Internal Monitoring Mechanisms and CEO Turnover: A Long-Term Perspective", *Journal of Finance*, 2001, 56: p. 2265-2298.
- Jensen, Michael C., 1986, Agency costs of free cash flow, corporate finance, and takeovers, *American Economic Review* 76, 323-329.
- Kaplan, S., "Are We All Becoming Henry Kravis Now? The Evolution of US Corporate Governance", 1996, University of Chicago Working Paper.
- Leavitt, H.H., and T.I. Whisler, "Management in the 1980s", *Harvard Business Review*, Nov-Dec 1958, 41-48.
- Osterman, P. 1996. *Broken ladders: Managerial careers in the new economy*. New York: Oxford University Press.
- Parkinson, C. Northcote, 1958, *Parkinson's Law or the Pursuit of Progress*, J. Murray: London.
- Pinsonneault, Alain and Kraemer, Kenneth L. 1997. "Middle Management Downsizing: An Empirical Investigation of the Impact of Information Technology" *Management Science*, Vol 43 (5). pp. 659-679.
- Powell, Walter, 1990, "Neither Market Nor Hierarchy: Network Forms of Organization." In *Research in Organizational Behavior*, edited by Barry Straw and Lawrence Cummings, 295-336. Greenwich, Conn: JAI Press.
- Powell, Walter, 2001, "The Capitalist Firm in the Twenty-First Century: Emerging Patterns in Western Enterprise", pp33-68 in Paul Di Maggio ed. *The Twenty-First Century Firm*, Princeton University Press, Princeton NJ.
- Prendergast, Canice, 2002, "The Tenuous Trade-off Between Risk and Incentives" *Journal of Political Economy*, vol. 110, no. 5, pp. 1071-1102.
- Pryor, Frederic L. 2000. "The Economics of the Good Society: The Variety of Economic Arrangements" *Journal of Economic Literature*, Vol. 38, Iss. 3. pp. 681-683.
- Pugh, D.S., D.J. Hickson, C.R. Macdonald, K.M. Turner, C. Turner and T. Lupton. 1968. "Dimensions of Organization Structure" *Administrative Science Quarterly* (13), pp. 65-105.
- Rebitzer, John B., and L.J. Taylor, 1997, "When Knowledge is an Asset: Explaining the Organizational Structure of Large Law Firms," MIT Working Paper.

- Rajan, R.G and Zingales, L. 1998. "Power in a Theory of the Firm" *The Quarterly Journal of Economics*, Vol. 113(2). pp. 387-432.
- Rajan, R.G and Zingales, L. 2000. "The Governance of the New Enterprise", pp 201-227 in *Corporate Governance, Theoretical and Empirical Perspectives*, Xavier Vives ed., Cambridge University Press, 2000.
- Rajan, R.G and Zingales, L. 2001. "The Firm as a Dedicated Hierarchy: A Theory of the Origins and Growth of Firms" *The Quarterly Journal of Economics*, Vol. 116 (3). pp. 805-51.
- Scott, Elizabeth D, O'Shaughnessy, K C, and Cappelli, Peter. 1996. "Management Jobs in the Insurance Industry: Organizational Deskillling and Rising Pay Inequity" *Broken ladders: Managerial careers in the new economy*. Osterman, Paul, ed., New York and Oxford: Oxford University Press. p 126-54.
- Scott, W. Richard, 1965, "Reactions to Supervision in a Heteronomous Professional Organization", *Administrative Science Quarterly*, 10: 65-81.
- Shleifer, A. and R.Vishny (1989), "Management Entrenchment: The Case of Manager-Specific Assets," *Journal of Financial Economics*, 25: 123-140.
- Stein, J.C., 2002, "Information Production and Capital Allocation: Decentralized vs. Hierarchical Firms", *Journal of Finance (Forthcoming)*.
- Useem, M. 1996. "Corporate Restructuring and the Restructured World of Senior Management" *Broken ladders: Managerial careers in the new economy*. Osterman, Paul, ed., New York and Oxford: Oxford University Press. p 23-54.
- Wernerfelt, Birger, 1984, "A Resource Based View of the Firm," *Strategic Management Journal* 5, 171-180.
- Williamson, O. 1985, *The Economic Institutions of Capitalism*. New York, NY: The Free Press
- Wulf, Julie, 2002, "Internal Capital Markets and Firm-Level Compensation Incentives for Division Managers," *Journal of Labor Economics*, 20, no. 2, pt. 2, s219-s262.

Table 1: Descriptive Statistics—Whole Sample (Unbalanced) and Balanced Sample

Panel A: Firm and Business Unit (Division) Manager Characteristics of Sample

Variable	Whole Sample (Unbalanced)				Balanced Sample (N=51)			
	Mean		STD	N	Mean		STD	N
	1986	1999	1999	(firm or division-years)	1986	1999	(firm or division-years)	
Size (000's Emp.)	47.45	47.62	67.99	3440	85.86	69.92	694	
Profitability	0.167	0.194	0.098	3464	0.162	0.206	689	
Physical Asset-Intensity	164.19	178.85	353.98	3434	100.63	123.96	694	
Age (Years)	--	84.8	40.81	3669	--	105.3	700	
Number of Segments	2.99	4.00	2.07	2666	3.29	4.78	655	
Inst. Shareholders (%)	51.6	62.0	16.0	2514	51.2	62.3	693	
Corporate Officer (%)	19.7	33.5	47.2	10390	23.6	27.9	3176	

Panel B: Industry Characteristics of Firms in Sample

Industry (2-digit SIC)	Distribution of Sample by 2-digit SIC Code				Distribution of Sample by 2-digit SIC Code			
	Whole Sample		Balanced Sample		Whole Sample		Balanced Sample	
	N (firm-yrs)	% of Sample	N (firm-yrs)	% of Sample	N (firm-yrs)	% of Sample	N (firm-yrs)	% of Sample
Food (20)	216	6.1	84	12.0	243	6.8	84	12.0
Paper (26)	136	3.9	28	4.0	140	4.0	28	4.0
Chemical (28)	495	14.1	182	26.0	167	4.6	14	2.0
Machinery (35)	354	10.1	28	4.0	415	11.8	14	2.0
Electrical (36)	161	4.6	28	4.0	1197	34.0	210	30.0

Notes: Whole sample includes all firms in the sample. Balanced sample includes firms that appear in the sample over the 14-year period. Panel A: Profitability is defined as EBITDA/Sales. Physical Asset-Intensity is defined as real fixed assets per employee in thousands of dollars. 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 % of shares held by institutions as reported by Spectrum. Corporate Officer indicates the proportion of occupants in divisional manager positions that are corporate officers of the firm.

Table 2: Organizational Span (SPAN): Number of Positions Reporting to the Chief Executive Officer

Year	Whole Sample (Unbalanced)				Balanced Sample (N=51)		
	Mean	Median	STD	N (firms)	Mean	Median	STD
1986	4.46	4	2.05	210	4.39	4	1.89
1987	4.61	4	2.12	231	4.65	5	1.97
1988	4.75	4	2.67	236	4.65	4	2.09
1989	5.07	5	2.53	228	4.71	5	1.95
1990	4.91	5	2.60	276	4.98	5	1.74
1991	4.81	4	2.96	289	5.25	5	2.08
1992	4.89	5	2.50	290	4.96	5	2.12
1993	5.01	5	2.24	304	5.53	5	2.10
1994	5.38	5	2.45	298	5.82	5	2.15
1995	5.65	5	2.54	288	6.47	6	2.64
1996	5.46	5	2.56	280	6.31	6	2.32
1997	6.10	6	2.94	248	7.08	6	2.75
1998	6.79	6	3.90	213	8.16	7	4.02
1999	6.70	6	3.80	178	7.16	7	3.10
Average	5.29	5	2.78	255	5.73	5	2.64

Notes: Whole sample includes all firms in the sample. Balanced sample includes firms that appear in the sample over the 14-year period.

Table 3: Organizational Span: Reports to the Chief Executive Officer (CEO) by Position (Balanced Sample; N=51)													
Year	Corporate Staff Positions						Intermediaries			Unit Heads			
	Chief Information Officer	Human Resources	Chief Financial Officer	General Counsel	Strategic Planning	Public Relations	Chief Operating Officer	Administrative Officer	Chief	Group Manager	Division Manager		
	Average Number						Average Number			Avg. No.	Probability	Avg. No.	Probability
1986	0.020	0.373	0.667	0.667	0.275	0.196	0.549	0.392	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	0.353	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	0.392	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	0.314	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	0.333	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	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	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	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	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	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	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	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	0.294	1.733	0.606	0.953	0.314
1999	0.176	0.686	0.882	0.902	0.275	0.510	0.451	0.216	0.216	1.488	0.457	0.659	0.191

Notes: Balanced sample includes firms that appear in the sample over the 14-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.

Table 4: Descriptive Statistics—Firm and Business Unit (Division) Characteristics (Means)

Year	Panel A: Whole Sample (Unbalanced)					Panel B: Balanced Sample (N=51)				
	Firm Size (000s emp.)	Depth	Division Size (000s emp.)	Division Coverage	N (firms)	Firm Size (000s emp.)	Depth	Division Size (000s emp.)	Division Coverage	Division Coverage
1986	47.5	1.49	3.8	0.53	260	85.9	1.58	6.0	0.42	0.42
1987	43.4	1.39	3.5	0.68	268	82.8	1.45	5.9	0.38	0.38
1988	42.0	1.43	3.4	0.46	278	84.3	1.51	5.2	0.38	0.38
1989	46.2	1.34	3.3	0.44	269	86.8	1.46	5.2	0.36	0.36
1990	44.7	1.28	3.1	0.39	299	86.2	1.36	5.1	0.33	0.33
1991	42.1	1.26	3.1	0.40	308	86.9	1.33	4.2	0.35	0.35
1992	41.3	1.29	3.1	0.37	306	83.2	1.35	4.4	0.33	0.33
1993	38.9	1.19	2.8	0.37	316	81.6	1.20	4.6	0.33	0.33
1994	41.1	1.08	3.1	0.42	313	81.8	1.19	5.1	0.37	0.37
1995	39.3	1.09	3.4	0.41	302	81.5	1.25	4.8	0.33	0.33
1996	42.6	1.14	3.6	0.43	298	79.6	1.30	5.5	0.37	0.37
1997	45.2	1.18	3.3	0.38	265	75.4	1.41	2.8	0.34	0.34
1998	49.5	1.14	3.7	0.39	231	73.8	1.18	4.7	0.40	0.40
1999	47.6	1.09	2.6	0.38	211	69.9	1.15	3.6	0.40	0.40
Average	43.3	1.24	3.3	0.43	280	81.4	1.34	4.8	0.36	0.36

Notes: Whole sample includes all firms in the sample. Balanced sample includes firms that appear in the sample over the 14-year period. 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 1 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.

Table 5: Measures of “Empowerment”—Division Manager Fixed Effects Regressions (Whole Sample)

Independent Variables	DEPTH		
	(i)	CEORPT	OFFICER
Log (Employees)	0.407*** (0.051)	-0.104*** (0.027)	-0.035 (0.025)
Log (Division Employees)	-0.097*** (0.015)	0.028*** (0.007)	0.038*** (0.009)
Trend	-0.025*** (0.003)	0.008*** (0.002)	0.007*** (0.002)
Constant	0.962*** (0.180)	0.204** (0.091)	0.031 (0.106)
Observations	10365	10390	10390
Number of Divisions	2348	2350	2350
R-squared	0.74	0.59	0.75

Notes: Whole sample includes all divisions in the sample that appear for at least two years. DEPTH is defined as the number of positions between the CEO and the Divisional Manager. CEORPT is a dummy variable equal to one if the Divisional Manager position reports directly to the CEO and zero otherwise. OFFICER is a dummy variable equal to one if the occupant of the Divisional Manager Position is a corporate officer and zero otherwise. Log (Employees) is defined as the log of the number of employees in the firm. Log (Division Employees) is defined as the log of the number of employees in the division. Trend takes on the values of 1 through 14 for the years 1986 through 1999. All specifications report robust standard errors by clustering on divisional manager position. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Table 6: Organizational Span and Depth-- Firm Fixed Effects Regressions (Whole Sample)

Independent Variables	SPAN		DEPTH	
	(i)	(ii)	(iii)	(iv)
Log (Employees)	-0.387*** (0.137)	-0.370*** (0.134)	0.306*** (0.039)	0.292*** (0.035)
COO		-1.064*** (0.092)		0.454*** (0.023)
CAO		0.342*** (0.102)		0.047* (0.025)
Trend	0.168*** (0.011)	0.158*** (0.011)	-0.022*** (0.003)	-0.016*** (0.003)
Constant	5.171*** (0.411)	5.582*** (0.405)	0.479*** (0.120)	0.256** (0.111)
Observations	3434	3434	2495	2495
Number of firms	369	369	324	324
R-squared	0.08	0.12	0.05	0.20

Notes: Whole sample includes all firms in the sample that appear for at least two years. Log (Employees) is defined as the log of the number of employees in the firm. COO and CAO are dummy variables equal to one if the firm reports a Chief Operating Officer (COO) and Chief Administrative Officer (CAO), respectively. Trend takes on the values of 1 through 14 for the years 1986 through 1999. Results are robust to including year dummy variables in place of trend. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Table 7: Compensation Structure by Categories of Organizational Span (SPAN)—Whole Sample

Categories of SPAN (No. of CEO reports)	Divisional Manager Salary and Bonus (\$)	Steepness	Divisional Manager Long-term Incentives	CEO Long-term Incentives
	(i)	(ii)	(iii)	(iv)
Panel A: Medians				
1 - 3	225,950	1.37	0.32	0.59
4 - 6	230,000	1.50	0.34	0.73
7 - 9	246,000	1.67	0.38	0.83
> 9	322,100	2.28	0.58	1.36
Median	242,000	1.56	0.36	0.66
Panel B: Means				
1 - 3	259,002	1.60	0.40	1.25
4 - 6	265,311	1.72	0.42	0.89
7 - 9	275,747	1.92	0.49	1.09
>9	356,480	2.61	0.73	1.72
Average	275,433	1.84	0.46	1.04
N	12,523	12,199	12,523	3469

Notes: Whole sample includes all divisions in the sample. SPAN is the number of positions reporting to the CEO. Steepness is defined as the difference between the salary and bonus of the CEO and the salary and bonus of the divisional manager divided by the salary and bonus of the divisional manager *and plus the depth* of the divisional manager. Divisional manager long-term incentives is defined as the ratio of the value of incentive pay for divisional managers to the sum of the salary and bonus. CEO long-term incentives is defined as the ratio of the value of incentive pay for the CEO to the sum of the salary and bonus. Long-term incentive pay includes restricted stock, stock options and other forms of long-term incentives (e.g. performance units, performance share plans, and phantom stock). Refer to the footnote in the text that describes the consulting firm's valuation of long-term incentives.

Table 8: Association of Components of Pay and Span—OLS, Fixed Effects (FE) and Between Estimator (BE) Regressions

Independent Variables	Dependent Variables are (log) Divisional Manager Salary and Bonus, Steepness, Divisional Manager LT Incentives, and CEO LT Incentives											
	Divisional Manager Salary + Bonus			Steepness			Divisional Manager LT Incentives			CEO LT Incentives		
	OLS	Divisional Manager FE	Divisional Manager BE	OLS	Divisional Manager FE	Divisional Manager BE	OLS	Divisional Manager FE	Divisional Manager BE	OLS	Firm FE	Firm BE
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)
SPAN	-0.010*** (0.002)	-0.009*** (0.002)	-0.006** (0.002)	0.058*** (0.006)	0.065*** (0.007)	0.060*** (0.007)	0.006** (0.003)	-0.002 (0.003)	0.012*** (0.002)	0.026* (0.014)	0.011 (0.012)	0.047*** (0.016)
DEPTH	-0.155*** (0.009)	-0.079*** (0.009)	-0.166*** (0.009)				-0.056*** (0.008)	-0.061*** (0.009)	-0.060*** (0.009)			
Log (Employees)	0.067*** (0.008)	0.056*** (0.021)	0.074*** (0.006)	0.231*** (0.016)	-0.148** (0.072)	0.238*** (0.016)	0.046*** (0.006)	0.074*** (0.029)	0.038*** (0.006)	0.207*** (0.021)	0.216** (0.091)	0.195*** (0.021)
Log (Division Empl.)	0.125*** (0.006)	0.084*** (0.008)	0.121*** (0.005)	-0.202*** (0.012)	-0.158*** (0.020)	-0.207*** (0.013)	0.045*** (0.005)	0.041*** (0.007)	0.043*** (0.005)			
Constant	11.296*** (0.045)	11.501*** (0.081)	11.297*** (0.044)	1.801*** (0.078)	2.647*** (0.252)	1.933*** (0.142)	-0.114*** (0.039)	-0.128*** (0.096)	-0.098** (0.043)	-0.267*** (0.091)	-0.241 (0.263)	-0.270 (0.551)
Observations	10365	10365	10365	10114	10114	10114	10365	10365	10365	3352	3352	3352
# of Divisions/Firms	2348	2348	2348	2332	2332	2332	2348	2348	2348	369	369	369
R-squared	0.45	0.87	0.51	0.17	0.68	0.23	0.21	0.69	0.28	0.25	0.53	0.34

Notes: Sample includes all divisions/ firms in the sample that appear for at least two years. All variables have been winsorized at the 99<sup>th</sup> percentile. Year dummy variables are included in all specifications. Divisional Manager pay is defined as the logarithm of salary plus bonus. Steepness is defined as the difference between the salary and bonus of the CEO and the salary and bonus of the divisional manager divided by the salary and bonus of the divisional manager *and one plus the depth* of the divisional manager. Divisional manager long-term incentives is defined as the ratio of the value of incentive pay for the CEO to the sum of the salary and bonus. Long-term incentive pay includes restricted stock, stock options and other forms of long-term incentives (e.g. performance units, performance share plans, and phantom stock). Refer to the footnote in the text that describes the consulting firm's valuation of long-term incentives. SPAN is the number of positions reporting to the CEO. DEPTH is defined as the number of positions between the CEO and the Divisional Manager. Log (Employees) is the log of the number of employees in the firm. Log (Division Employees) is the log of the number of employees in the division. OLS and Division Manager/ Firm Fixed Effects regressions report robust standard errors by clustering on divisional manager position/ firm. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Table 9: Organizational Depth/ Span and Institutional Ownership Firm Fixed Effects and Between Estimator Regressions

	DEPTH		SPAN	
	Firm Fixed Effects (i)	Firm Between Estimator (ii)	Firm Fixed Effects (iii)	Firm Between Estimator (iv)
Log (Employees)	0.285*** (0.046)	0.185*** (0.029)	0.022 (0.158)	0.225*** (0.082)
Institutional Ownership (%)	-0.091 (0.168)	0.145 (0.251)	-0.495 (0.560)	1.421** (0.706)
Trend	-0.019*** (0.004)	-0.048*** (0.015)	0.154*** (0.013)	0.128*** (0.047)
Constant	0.585*** (0.164)	0.950*** (0.182)	4.401*** (0.524)	2.957*** (0.571)
Observations	1911	1911	2514	2514
Number of Firms	263	263	305	305
R-squared	0.04	0.17	0.05	0.07

Notes: Sample includes all firms that appear for at least two years. All variables have been winsorized at the 99<sup>th</sup> percentile. Log (Employees) is the log of the number of employees in the firm. Institutional ownership is defined as the (lagged) percentage of stock in the firm that is held by institutional shareholders. Trend takes on the values of 1 through 14 for the years 1986 through 1999. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Table 10: Turnover of an Incumbent CEO: Cox Regression

Independent Variables	(i)	(ii)	(iii)	(iv)
No COO	0.537*** (-2.98)	0.502* (-1.68)		
Successor			0.298*** (-3.38)	0.338* (-1.80)
Retiredum		4.705*** (4.54)		4.890*** (4.75)
Observations	916	377	916	377

Notes: This analysis evaluates the time to failure for a CEO i.e. the time that a CEO stays in office measured by the years from the first year that the incumbent becomes CEO to the year of turnover. Hazard ratios are reported in the table (and corresponding z-stats are in parentheses). In columns (i) and (ii), the independent variable of interest is No COO which is a time-varying dummy variable equal to one in the years following a drop in the COO position and zero otherwise. In columns (iii) and (iv), the independent variable of interest is Successor which is a dummy variable equal to 1 if the predecessor CEO dropped a COO. Retiredum is a dummy variable equal to one if the CEO is 65 or older and zero otherwise. If the dependent variable is observed without any realization, it is treated as a censored event. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Table 11: Provision of Divisional Manager Long-Term Incentives—2SLS Regression

Independent Variables	1 <sup>st</sup> stage		2 <sup>nd</sup> stage	
	Officer is Dependent Variable		LT Incentives is Dependent Variable	
	(i)		(ii)	
Officer			0.350*** (0.104)	
Division Industry Volatility	0.001*** (0.000)			
Relative Division Size	0.056*** (0.006)			
Log (Firm Employees)	0.051*** 0.006		0.052*** (0.006)	
Constant	-0.092** (0.036)		0.048 (0.033)	
Observations	6828		6828	
Number of Divisions	2012		2012	

Notes: All variables have been winsorized at the 99<sup>th</sup> percentile. Year dummy variables are included in both specifications. OFFICER is a dummy variable equal to one if the occupant of the Divisional Manager Position is a corporate officer and zero otherwise. Divisional manager long-term incentives is defined as the ratio of the value of 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 (e.g. performance units, performance share plans, and phantom stock). Refer to the footnote in the text that describes the consulting firm's valuation of long-term incentives. Industry Volatility is defined as the average standard deviation of EBITDA/Sales for the 20 previous quarters for firms in the same 3 digit SIC code as the division's industry. Relative Division Size is defined as the log of the number of employees in the division divided by the log of the number of employees in the firm. Log (Firm Employees) is the log of the number of employees in the firm. Regressions report robust standard errors by clustering on divisional manager positions. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Table 12: Human Capital--Firm Fixed Effects and Between Estimator Regressions

Dependent variables are SPAN (number of positions reporting to the CEO) and DEPTH (number of positions between the CEO and the Divisional Manager)				
Independent Variables	SPAN Firm Fixed Effects (i)	SPAN Firm Between Estimator (ii)	DEPTH Firm Fixed Effects (iii)	DEPTH Firm Between Estimator (iv)
Log (Employees)	-0.385*** (0.129)	0.237*** (0.070)	0.350*** (0.040)	0.189*** (0.026)
Physical Asset-Intensity (RFASSEMP)	-0.002*** (0.001)	-0.001*** (0.000)	0.001** (0.000)	-0.000 (0.000)
Trend	0.170*** (0.010)	0.120*** (0.045)	-0.023*** (0.003)	-0.049*** (0.013)
Constant	5.422*** (0.425)	3.801*** (0.438)	0.282*** (0.134)	0.992*** (0.138)
Observations	3592	3592	2606	2606
Number of firms	369	369	324	324
R-squared	0.09	0.09	0.06	0.18

Notes: All variables have been winsorized at the 99<sup>th</sup> percentile. SPAN is the number of positions reporting to the CEO. Depth is number of positions between the CEO and the Divisional Manager. Log (Employees) is the log of the number of employees in the firm. Physical Asset-Intensity (RFASSEMP) is defined as real fixed assets per employee in thousands of dollars. Trend takes on the values of 1 through 14 for the years 1986 through 1999. \*\*\*/\*\*/\* represent significance at the 1%/5%/10% level.

Figure 1: 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		

### Descriptions of 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 of 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 of 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.

## 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 tax.
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 corporate-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. The highest authority in the group.
11. Division Chief Executive. The highest authority in the division.