

**Title:** Operational Efficiency and Corporate Structure

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**Abstract:**

Operational risk is the risk of loss due to people, process or technology. It does not carry a higher potential reward as more risk is taken and this makes it unique among traditional risk classifications. It never pays, it only costs. This risk is also unique in that it tends to hedge itself. As more management levels are added to an organization fewer errors should occur due to greater supervision. In this study I will review some correlations between the operating income per employee and some elements of company structure for the S&P 500 that are proxies for management control and supervision. An analysis yielded the following general observations: 1) Companies in which the chairman and CEO roles are combined generate more income per employee than those in which the roles are separate; 2) Companies with a lead director and the chairman and CEO combined typically do better still; 3) The more executive officers a company has the higher operating income is generated per employee although this decreases marginally; and 4) Companies tend to gravitate towards a structure with 10 executive officers and 10 directors, this is a fixed point of an iterative decision function.

**Type:** A study based on the companies listed in the S&P 500 as of September 1, 2009 over the 2005-2008 period.

**Biography:** Mr. Jacobi is an FSA, CERA with two years experience as an actuary in the disability finance unit of Metropolitan Life Insurance Company. Nick began his career as the senior mathematician at Gaming Laboratories Intl. and also has three years of experience as an actuary with Guardian Life Insurance. He is a graduate of Lafayette College in Easton, Pennsylvania.

**Introduction**

The previous five years will be seen as an experiment in the effect of market versus government forces. This paper is not a reference to the underlying economics but is instead a study in efficiency and the role corporate structure played. Operational risk is often measured by failure but is at its core related to a company's efficiency.

Hypothetically the more supervision employees have the fewer mistakes they should make, thus lowering operational losses. However, too many managers leads to systemic inefficiency as payroll levels become unmanageable. Successful companies are able to balance these two forces and make effective tradeoffs between operational risk and efficiency<sup>1</sup>. This paper attempts to develop a metric for efficiency and conducts a study of it based on corporate structure across the companies in the S&P 500 index as of the beginning of September, 2009.

**An Efficiency Metric**

A firm's operating earnings is the amount of profit realized from its own operations. It is synonymous with EBIT (earnings before interest and taxes) and can be represented by

$$\text{Operating earnings} = \text{gross revenue} - \text{operating expenses} - \text{depreciation}$$

It differs from earnings or net income due to the exclusion of taxes, interest earnings, and some other items. Since these are not subtracted this measure corresponds to the success or failure of a firm's core business. Note the effect of write-downs is not included in this metric. Nothing is perfect and as a caveat gross revenue can be allocated in creative ways - but usually not for very long without corresponding expense increases. For the purposes of the study this paper looks at the operating earnings on a yearly basis from 2005 through 2008. As a proxy for efficiency (and sometimes production itself) the ratio of operating earnings to total employees worldwide was studied.

$$\text{Efficiency Ratio} = \frac{\text{Operating Earnings}}{\text{Employees}}, \text{ in 000s.}$$

### General Observation on the Data

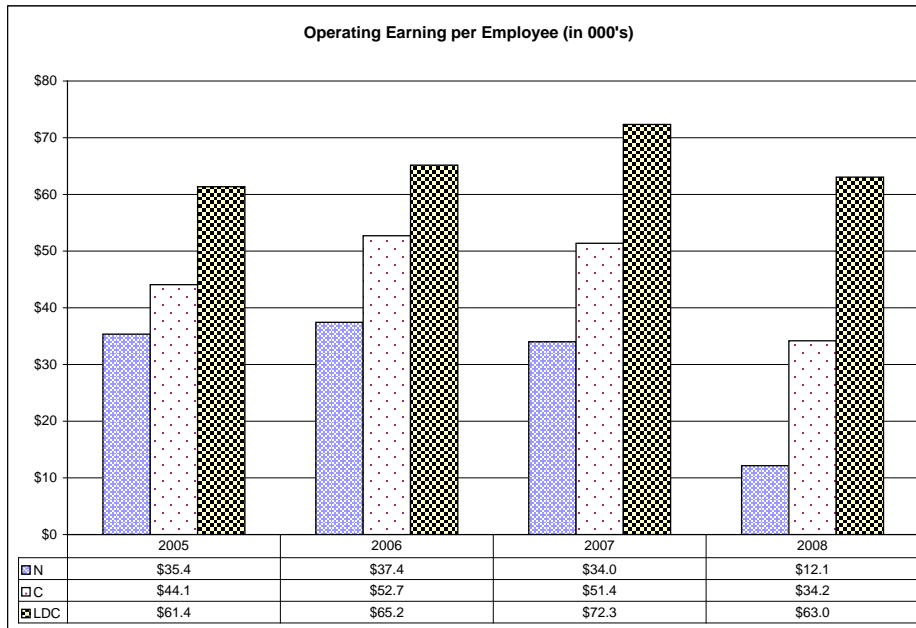
Tracking operating earnings and employees across the S&P by year revealed some interesting observations. The drop in operating earnings was a leading indicator of the latest recession, but the 2008 drop did not translate into immediate staff reductions. Earnings per employee were relatively stable before the recession.

Year	Operating Earnings (mils)	Employees (000s)	Change in Operating Earnings	Change in Employees	Operating Earnings Per EE (000s)
2005	\$944,846	20,577			\$45.9
2006	\$1,090,429	21,215	15.4%	3.1%	\$51.4
2007	\$1,061,575	21,610	-2.6%	1.9%	\$49.1
2008	\$620,065	21,386	-41.6%	-1.0%	\$29.0
<b>Total</b>	<b>\$3,716,915</b>	<b>84,787</b>	<b>-34.4%</b>	<b>3.9%</b>	<b>\$43.8</b>

### Efficiency Ratio versus Company Type

Companies in the survey were classified into three main types. Companies in which the chairman of the board is also the CEO were classified as "C" companies. If these companies had a separate lead director role on the board they were further labeled "LDC" companies. Companies with separate chairman and CEO were classified as "N". Total operating earnings and employees were aggregated across these classifications to arrive at the operating earnings per employee by class. The results, projected year over year, show that companies under the LDC structure had consistently higher operating earnings per employee than the other types. In particular, as times changed in 2007-2008 LDC companies were more resilient than those under other structures and suffered far less in terms of efficiency based on this measure. The C companies did do universally better

than the Ns. It is possible that uniting the chairman and chief executive roles reduces the communication problem between shareholders and management and the addition of a lead director setting the agenda adds additional purpose to company operations.



### Employee Efficiency versus Management Supervision

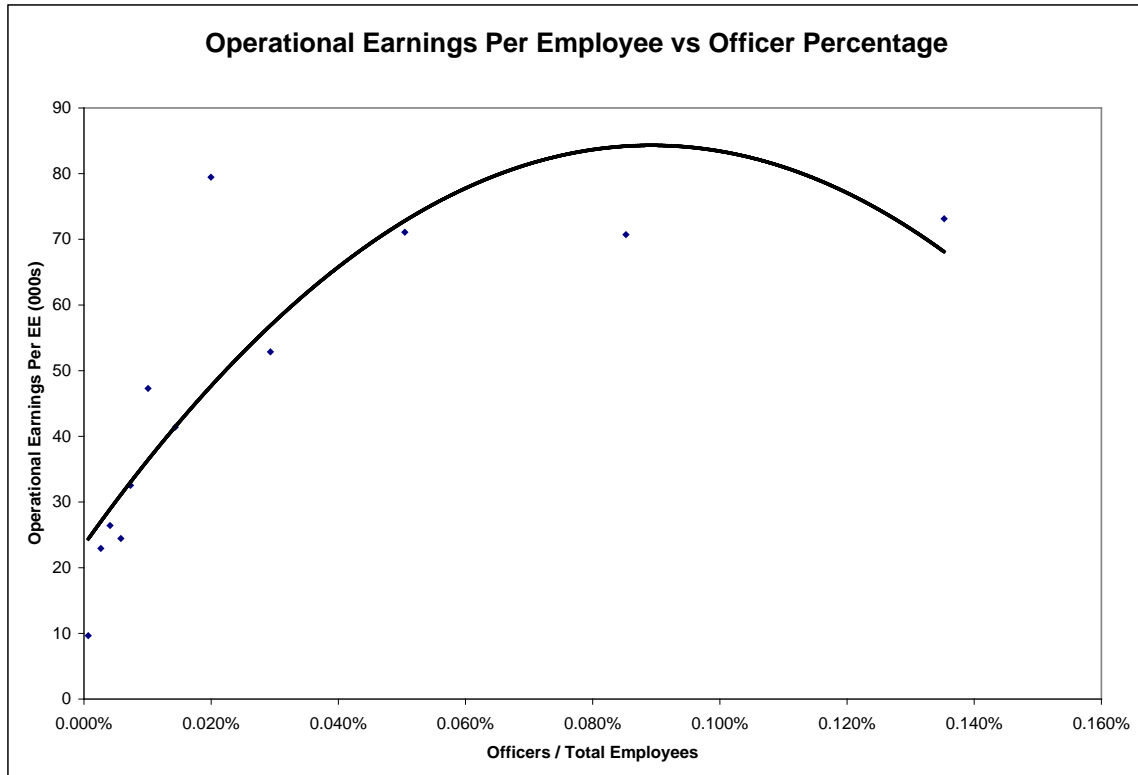
Approximately five percent of the nationwide workforce is made up of managers or supervisors<sup>2</sup>. Public companies typically do not report management enrollment explicitly so the number of executive officers of each company was used as a proxy. In particular the percentage of the workforce that is at the highest executive level versus the operating earnings per employee showed some interesting results.

The expected operating income per employee based on officer percentage can be modeled by

$$\text{OpPerEE} = -76,423,905 P^2 + 136,388 P + 23$$

with a 73% fit, where P is the percent of employees that are officers and OpPerEE equals the operating earnings per employee in thousands.

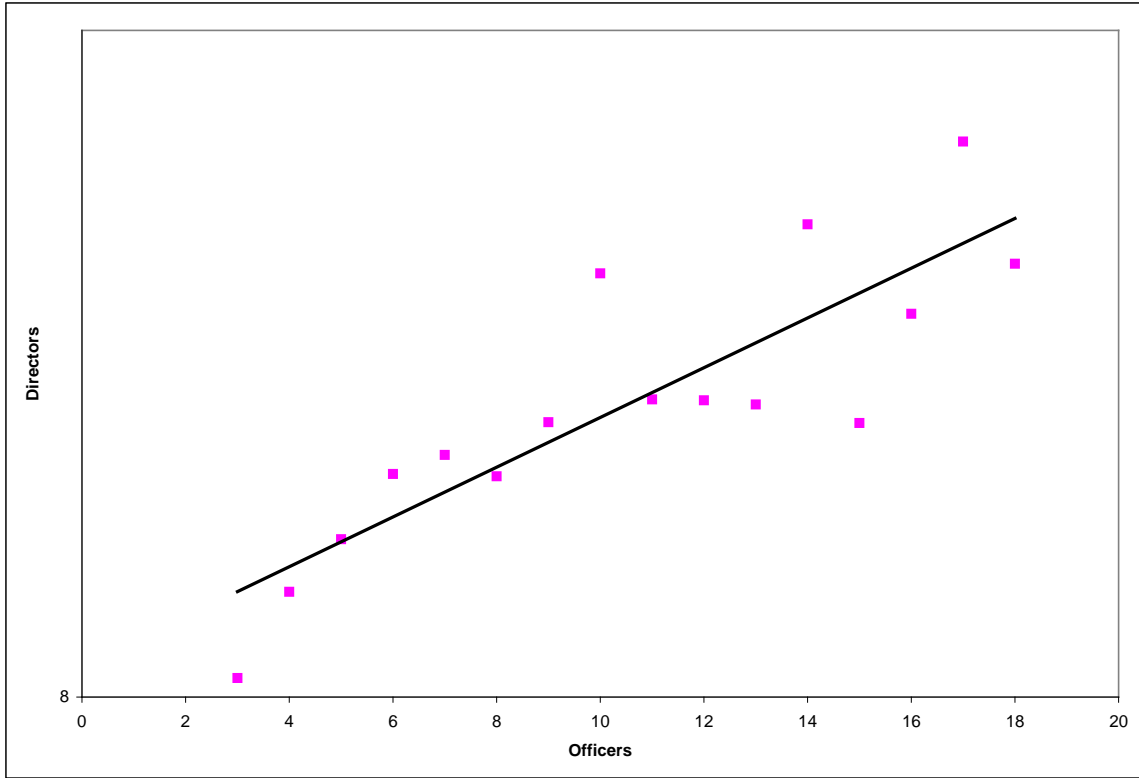
Efficiency increases as P is increased but these gains diminish as officers are added, dropping from a 21% gain in operating earnings per employee when moving from 2 to 3 bp of officer level to 1% gain from 8 to 9 bp.



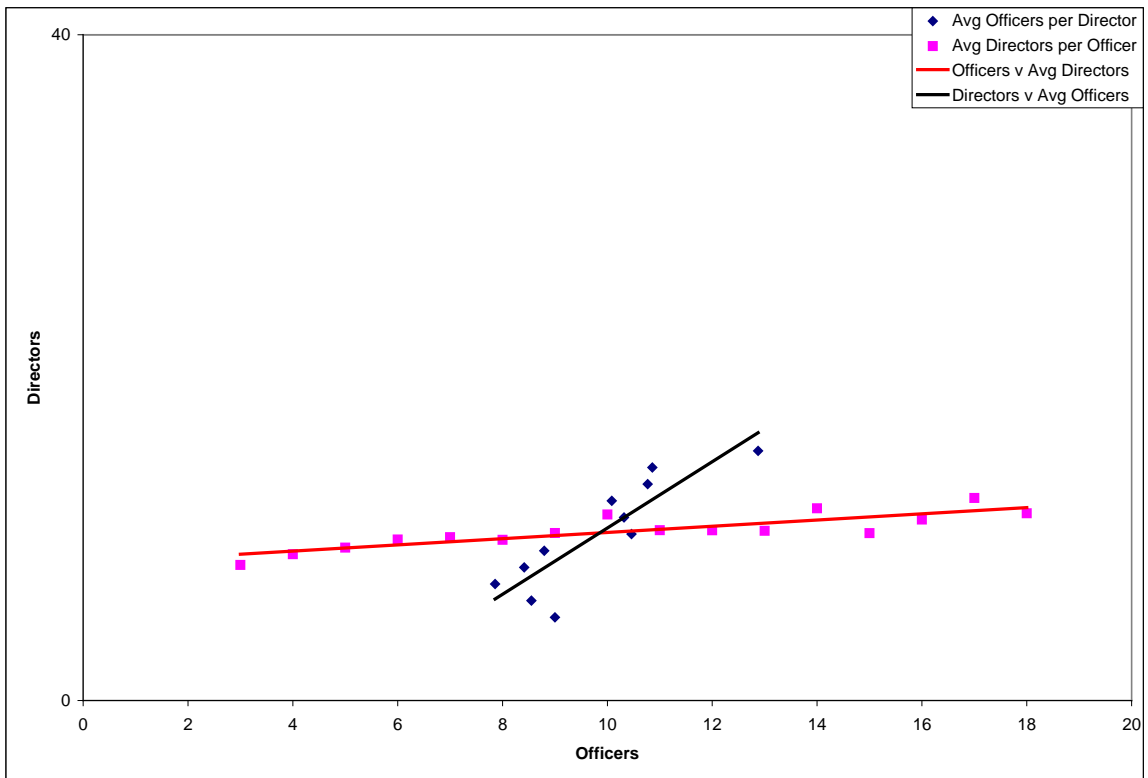
Indeed efficiency drops off once officers represent more than 9bp of employees.

### Number of Officers and Directors

Companies studied commonly had between 3 and 32 executive officers and directors. Initially there was no pattern found between these numbers, however when the average number of board members per director is analyzed the following pattern appears (shown with regression line).

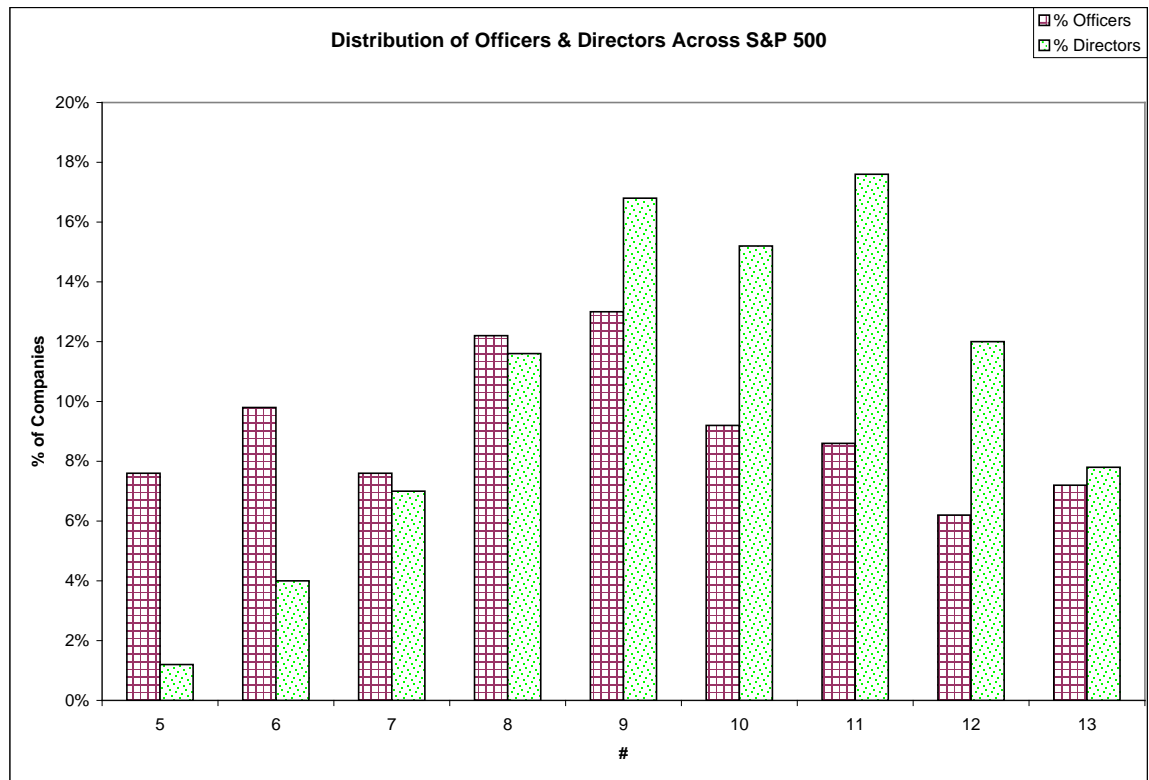


The data had a linear fit of 76%. Similarly, regressing the average number of officers per board member produced a linear fit of 73% and created a fixed point slightly below the 10 officer mark.



It is evident from the slope of each line that on average, when a company adds a new officer there is little pressure to add an extra director, but when the number of directors increases there is a great deal of pressure to increase the officer ranks. Moreover, the two lines meet at a fixed point. This suggests that as iterations of officer/director enrollment decisions are made companies will gravitate to a structure with about 10 officers and directors.

The fixed point occurs at 9.85 executive officers and 10.06 directors to be precise. Indeed the distribution of directors and officers across the five hundred companies shows that directors are distributed around ten while nine is the most popular number for executive officers, though with some volatility.



## Lessons Learned

To summarize: Employment is sticky—operating income drops drastically before employee reduction actually occurs. Companies with an LDC structure are on the whole more efficient than those under comparable structures although uniting the chairman and CEO roles seems to increase efficiency somewhat. Efficiency also increases as managers are added but excessive management does impair it. As companies are forced to make tradeoffs between the number of executive officers and directors they tend toward a structure with about 10 of each. There seems to be little pressure to increase board membership as executive officers are added, the opposite is true when board members are added.

## Notes on Data Used

The 500 companies studied reflect those companies currently in the S&P 500 index and represent about 75% of the economy based on market capitalization. Employee counts and operating earnings were gleaned from the annual statements filed with the SEC. Note that often companies round their employment to the nearest hundred or thousand.

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<sup>1</sup> Bad tradeoffs between efficiency and operational risk are possible too. Consider a company that contracts a third party system to allow employees to complete a certain task. The system allows the task to be completed in fifteen minutes by its users. It is fast but expensive and prone to fraud or abuse. At some point the company replaces this system with one that is much cheaper and more exacting but each use takes two hours. Dollar savings appear in immediate accounting statements, but the loss of time shows up only as an efficiency loss - which is internal and may never affect financial reports.

<sup>2</sup> 1 in 22 employees are managers based on United States Bureau of Labor Statistics, 2009