

December 2019

“Ceo pay in perspective”

Marcel Boyer

CEO PAY IN PERSPECTIVE

Marcel Boyer* Ph.D., O.C., FRSC

Emeritus Professor of Economics, Université de Montréal

Abstract: The CEO pay ratio, measured as the ratio of CEO pay over the median salary of a firm's employees, is the most often quoted number in the popular press. This ratio has reached 281 this last year for S&P500 firms, the largest US firms by capitalization (as of November 21 2019). But the B-ratio I proposed here, measured as the CEO pay over the total payroll of the firm, relates CEO pay to the salary of each employee and may be the most relevant and informative figure on CEO pay as perceived by the firm's employees themselves. How much a typical employee of the S&P500 firms implicitly "contributes" to the salary of his/her CEO? An amount of \$273 on average or 0.5% of one's salary, that is, one half of one percent on an individual salary basis. To assess whether such a contribution is worthwhile, one must determine the value of the CEO for the organization and its workers and stakeholders. The Appendix provides the data for all 500 firms regrouped in 10 industries (Bloomberg classification).

Key words: CEO pay ratio, B-ratio, S&P500, Bloomberg, Real options

**For transparency, I declare that I received no financial aid or support for this project,
neither from public sources nor from private sources.
This research is therefore totally independent.**

*I would like to thank my research assistant Owen Skoda for his help.

Outline

- I. Introduction
- II. The S&P 500 firms
- III. The value of management (CEO)
- IV. Conclusion
- V. Data Appendix

I. Introduction

In September 2017, the U.S. Securities and Exchange Commission (SEC) has approved interpretive guidance to implement the pay ratio disclosure requirement mandated by the Dodd-Frank Wall Street Reform and Consumer Protection Act, signed by President Barack Obama in July 2010. Under the SEC rule, companies are required to disclose, starting in early 2018, their CEO pay ratio. This pay ratio disclosure rule compels companies to provide information on the pay of their CEO and the median salary paid to their employees.

The SEC leaves some limited leeway to the firms in determining the median salary, which can cover all employees or only US-based ones if the latter represent more than 95% of employees. The SEC rule allows firms to use reasonable estimates, assumptions and methodologies, clarifies that a company may use appropriate existing internal records, such as tax or payroll records, in identifying the median employee, and provides guidance as to when a company may use widely recognized tests to determine whether its workers are employees for purposes of the rule. Under the rule, employees of consolidated subsidiaries must be included and those of independent suppliers must be excluded. In spite of all the complexities and intricacies firms must deal with, the information is quite informative and interesting.

The CEO pay ratio, defined as the firm's CEO pay over the firm's median employee salary, reached 281 this last year for the S&P500 firms. Although media coverage reports mainly this ratio, it may not be the most informative and relevant measure of the discrepancy between the CEO pay and the median pay in the firm.

Other ratios such as the CEO pay per employee as well as the B-ratio I propose here (defined as the firm's CEO pay over the firm's estimated total payroll, measured by the number of employees times the median salary) are clearly more informative and relevant. Being based on the median compensation rather than the average compensation of employees, the B-ratio is a prudent (over)estimate of the CEO pay as a percentage of the total payroll.

II. The S&P 500 firms

Based on data for 500 of the largest corporations compiled by Bloomberg (S&P500 firms)¹ from SEC filings by firms (Table 1), we obtain that the CEOs of those large companies earned an average 14.2 million US\$ and a median \$12.4 million US\$ in 2018-19. As mentioned above, the average CEO pay ratio over all firms is 281. However, firms greatly differ in size and more representative ratios are the median CEO pay ratio 170 and the weighted average CEO pay ratio 185, measured as the total paid to all CEOs divided by the total of all median salaries over all 500 firms. The CEOs pay represents a weighted average \$273 per employee (average CEO pay over all firms / average of median salaries over all firms) and gives a weighted average B-ratio of 0.50% (average CEO pay over all firms / average of total pay over all firms).

Table 1

	Median employee salary	CEO pay	Nb. employees	Total Pay	CEO pay ratio	CEO pay per employee	B-Ratio: CEO pay over Total Pay
TOTAL (500 firms)	38 322 909	7 075 139 827	25 949 452	1 418 090 427 194			
Average over 500 firms	76 646	14 150 279	51 899	2 836 180 854	281	1961	2,30%
Median over 500 firms	67 771	12 400 000	18 170	1 292 128 750	170	564	0,88%
Weighted average					185	273	0,50%

Source: Bloomberg <https://www.bloomberg.com/graphics/ceo-pay-ratio/> (21 November 2019), based on the latest SEC filings.

Hence, each of the 26 million employees in those 500 firms “contributes” on average \$273 to the pay of their CEO, or about one half of one percent of their respective salary. Seen differently, if we were to divide the CEO pay equally among all employees, the resulting employee yearly pay increase would be \$273. If we do it proportionately to the employee salary, the resulting employee pay increase would be one half of one percent.

¹ See also the AFL-CIO Executive Paywatch database at <https://aflcio.org/paywatch>

Suppose we ask employees the following two questions:

Question #1: Would you be ready to contribute one half of one percent of your annual salary (\$250 for a salary of \$50,000; \$500 for a salary of \$100,000) to hire the best CEO we can find to manage your firm and in particular to ensure and enhance its profitability, sustainability, and growth, and, in so doing, to protect your job, now and in the future, including your pension?

Question #2: Would you find appropriate to pay your CEO some 281 times the median salary in your firm to manage your firm and in particular to ensure and enhance its profitability, sustainability, and growth, and, in so doing, to protect your job, now and in the future, including your pension?

I expect that many more employees would say yes (a large majority would!) to question #1 than to question #2. This is a revealing example of the need to appropriately inform the question.

Only the former question, the “one half of one percent question”, makes sense information-wise as well as economically and socially. People can easily understand a question directly tied to their salary. A question framed as a 281 multiple, 170 multiple, or 185 multiple of a median salary is much more difficult to understand as its economic meaning is rather obscure even to economists and accountants.

The variability among firms and industries

As expected, those measures, namely the CEO pay ratio, the CEO pay per employee, and the B-ratio vary across firms and industries.

Expressed per industry (Bloomberg classification), we observe the following:

Table 2: Data by industry groups

Industry	(A) Total firms	(B) Total. employees	(C) CEO pay Average	(D) Median pay	(E) CEO pay ratio	(F) CEO pay /employee	(G) B-ratio
Telecom	9	765,810	31.3M\$	\$83,174	376	\$368	0.45%
Discretionary	76	6,333,500	14.9M\$	\$40,787	365	\$179	0.58%
Staples	35	4,708,234	12.7M\$	\$46,741	273	\$95	0.31%
Energy	28	577,901	14.3M\$	\$121,706	118	\$695	0.71%
Financials	100	2,935,095	12.1M\$	\$82,565	146	\$411	0.58%
Health care	59	2,473,008	15.8M\$	\$84,122	188	\$377	0.56%
Industrials	65	3,979,975	13.6M\$	\$66,546	204	\$222	0.33%
Materials	26	702,803	14.4M\$	\$67,721	213	\$532	0.88%
Technology	74	3,114,672	15.0M\$	\$94,536	159	\$357	0.47%
Utilities	28	358,454	10.8M\$	\$111,758	97	\$846	0.75%
Total Weighted Averages	500	25,949,452	14.2M\$	\$76,646	185	\$273	0.50%

There are different reasons for this variability, including how critical and specific the role and importance of the CEO leadership and competencies in the design, implementation, and management of the firm strategies and actions. In general, the CEO-led exercise of the firm's underlying real options have significant impacts on the performance, profitability, and growth of the firm and, in so doing, on the overall well-being of employees, shareholders, and other stakeholders, including suppliers and clients. But this CEO role and importance may differ across firms and industries as well as across countries. Understanding how and why is therefore essential. We tackle these questions later in Section III.

Among the 500 firms considered here (see the Data Appendix), the CEO pay level ranges from less than half a million (Alphabet, Twitter, Copart, and Berkshire Hathaway; even \$0 in the case of Twitter and Alphabet)² to \$108.3 million (Oracle) and \$129.5 million (Discovery Communications), with an average level of \$14.2 million and a median level of \$12.4 million.

² These firms clearly decided to pay their CEO less through salary and more through options and bonuses, explicitly or implicitly.

When firms are regrouped by industry sectors (Table 2), the sector-average CEO pay level ranges from \$10.8 million (Utilities) to \$31.3 million (Communications).

CEO pay is not the only source of compensation of CEOs. Other forms of compensation, such as options and bonuses, are incentive-based and related to different measures of the firm's performance and are therefore risky and uncertain. These are not considered as CEO pay, which relates more to a given and certain payment or salary. Among still other forms of incentives are the value of stock portfolios detained by CEOs. But these are not really different from the stock ownership by people or groups such as unions, whose returns are not considered as salary.

Similarly, the median salary paid to employees varies a lot across the 500 firms considered. It goes from less than \$10,000 (Mattel, The Gap, McDonald's, and Foot Locker) to \$232,178 (Vertex Pharma) and \$246,800 (Alphabet), with an average of \$76,646 and a median of \$67,771. When firms are regrouped by industry sectors, the sector-average median salary level ranges from \$40,787 (Consumer Discretionary) to \$121,706 (Energy).

As for the number of employees, it goes from less than 1,000 (Federal Realty Investment Trust, Cabot Oil & Gas, MarketAxess Holdings, Nektar Technologies, VeriSign Inc.) to 647,500 (Amazon) and 2.2 million (Walmart), with an average of 51,899 and a median of 18,170. If we drop Walmart from the sample (a true outlier), the average falls to 47,594. When firms are regrouped by industry sectors, the sector-average number of employees ranges from 12,802 (Utilities) to 134,521 (Consumer Staples), the latter number being driven up by Walmart. Without Walmart, the largest sector-average number of employees is 84,327 (Consumer Discretionary).

Given the variations in median salaries and number of employees, one expects that total payroll will vary a lot among firms. Indeed, the total payroll, evaluated with the median salary rather than the average salary, ranges from \$16.1 million (Realty Income Corp.) and \$25.1 million (Cabot Oil & Gas) to \$25.7 billion (AT&T), \$26.7 billion (UPS) and \$48.3 billion (Walmart), with an average of \$2.8 billion and a median of \$1.3 billion. When firms are regrouped by industry sectors, the sector-average total payroll ranges from \$1.4 billion (Utilities) to \$6.3 billion (Communications).

The relative similarity of CEO salaries across industries (Table 1) and the important variation in the number of employees mean that the ratio of CEO pay per employee will vary greatly across

firms. In fact, it goes from less than \$50 (Home Depot, UPS, Starbucks, Accenture) to over \$40,000 (Cabot Oil & Gas, Realty Income Corp.), with an average of \$1,961, a median of \$564, and a weighted average of \$273. If we drop the lowest ten and the largest ten CEO pay per employee (twenty outliers), we obtain for the remaining 480 firms, an average of \$1,317, a median of \$564, and a weighted average of \$178.

Finally, the CEO pay as a percentage of total payroll, which measures the “contribution” of individual employees to the salary of their CEO as a percentage of their respective salaries (the B-ratio), varies from less than 0.10%, that is, one tenth of one percent (Alphabet, Twitter, Berkshire Hathaway, UPS, IBM, Walmart, Copart), to 50% (Realty Income Corp.) and 52% (Cabot Oil & Gas), with an average contribution of 2.30%, a median contribution of 0.88%, and a weighted average (total CEO pay over all firms divided by total payroll over all firms, evaluated at the median salary) of 0.50% or one half of one percent.

The data for some individual firms

It may be informative to consider the special cases of some specific firms. Table 3 provides the data for some firms, one per industry (same order as above). The selected firms need not be representative of their industry.

Table 3: Data for some firms (one per industry group)

Firm	Nb. of employees	CEO pay (M\$)	median pay (\$)	CEO pay ratio	CEO pay per employee (\$)	B-ratio (%)
AT&T	268,220	29.1	95,814	304	109	0.11
Netflix	7,100	36.1	202,335	178	5,085	2.51
Walmart	2,200,000	23.6	21,952	1076	11	0.05
Exxon Mobil	71,000	18.8	171,375	110	265	0.15
BlackRock Inc.	14,900	26.5	136,313	194	1,779	1.30
Merck & Co.	69,000	20.9	91,954	227	303	0.33
General Electric	283,000	20.1	58,204	345	71	0.12
DuPont Inc.	98,000	18.7	75,018	249	191	0.25
Microsoft	144,000	42.9	172,512	249	298	0.17
Cons. Edison	15,591	9.8	106,453	92	629	0.59

AT&T.³ A multinational conglomerate holding company, AT&T is the world's largest telecommunications company, as well as the largest provider of mobile telephone services and the largest provider of fixed telephone services in the United States. It is also the parent company of mass media conglomerate WarnerMedia, making it the world's largest media and entertainment company in terms of revenue (ranked #9 on the Fortune 500 rankings of the largest United States corporations by total revenue). On June 12, 2018, AT&T was given permission by U.S. District Court Judge Richard J. Leon to go ahead with its \$85 billion deal for Time Warner. The DOJ had attempted to stop the merger fearing it would harm competition. The merger closed two days after, Time Warner becoming a wholly owned subsidiary and division of AT&T with a new name, WarnerMedia, announced the next day.

According to its SEC filing of March 11 2019, AT&T has some 268,220 employees and pays a median salary of \$95,814 to its employees for a payroll of \$25.7 billion, estimated at the median salary. Its CEO is paid a salary of \$29.1 million, which implies a CEO pay ratio of 304, a CEO pay per employee of \$109 and a B-ratio of 0.11%. Hence the CEO salary represents on average \$109 per employee or about one tenth of one percent of each employee's salary.

Alphabet. An American multinational conglomerate, Alphabet was created through a corporate restructuring of Google on October 2, 2015, and became the parent company of Google and several former Google subsidiaries. Alphabet is the world's fifth-largest technology company by revenue and one of the world's most valuable companies. The establishment of Alphabet was prompted by a desire to make the core Google internet services business "cleaner and more accountable" while allowing greater autonomy to group companies that operate in businesses other than Internet services.

“Alphabet is mostly a collection of companies. The largest of which, of course, is Google. This newer Google is a bit slimmed down, with the companies that are pretty far afield of our main internet products contained in Alphabet instead. [...] Fundamentally, we believe this allows us more management scale, as we can run things independently that aren't very related” (Larry Page, CEO of Alphabet).

³ The following paragraphs make use of information found on Wikipedia for the characteristics of the firms and found on Bloomberg for the information on SEC filings.

According to its SEC filing of April 30 2019, Alphabet has some 98,771 employees and pays a median salary of \$246,804 to its employees for a payroll of \$24.4 billion, estimated at the median salary. Co-founder and former chief executive officer (CEO) of Google Larry Page has been paid an annual salary of only \$1 every year since the company went public. Hence Alphabet's CEO pay ratio is 0, as its CEO pay per employee and B-ratio.

CEOs such as Page typically have such large stock holdings that they can afford to make the largely symbolic gesture of accepting only \$1 as a paycheck. Page's foregoing high pay in favor of holding a large equity stake suggests that he is looking out for shareholders. Since his wealth increases only if the stock's value increases, his own interests may be more aligned with the company's success.

Berkshire Hathaway. An American multinational conglomerate holding company, Berkshire Hathaway wholly owns GEICO, Duracell, Dairy Queen, BNSF, Lubrizol, Fruit of the Loom, Helzberg Diamonds, Long & Foster, FlightSafety International, Pampered Chef, and NetJets, and also owns 38.6% of Pilot Flying J., 26.7% of the Kraft Heinz Company, and significant minority holdings in American Express (17.6%), Wells Fargo (9.9%), The Coca-Cola Company (9.4%), Bank of America (6.8%), and Apple (5.22%). Since 2016, the company has acquired large holdings in the major US airline carriers, and is currently the largest shareholder in United Airlines and Delta Air Lines, and a top three shareholder in Southwest Airlines and American Airlines.

The company is known for the control and leadership of Warren Buffett, who serves as chairman and CEO. According to the Forbes Global 2000 list and formula, Berkshire Hathaway is the third largest public company in the world, the tenth largest conglomerate by revenue and the largest financial services company by revenue in the world. As of February 2019, Berkshire is the fifth-largest company in the S&P500 Index by market capitalization and is famous for having the most expensive share price in history with Class A shares costing around \$300,000 each.

According to its SEC filing of March 15 2019, Berkshire Hathaway has some 389,373 employees and pays a median salary of \$58,691 to its employees for a payroll of \$22.9 billion, estimated at the median salary. CEO Warren Buffett is paid a salary of \$388,968 (\$100,000 in salary and the

rest in other compensation), which implies a CEO pay ratio of 7, a CEO pay per employee of \$1 and a B-ratio of 0%.

CEOs such as Buffett can afford to make the largely symbolic gesture of accepting peanuts as a paycheck. Moreover, Buffett is not in favor of making CEO pay public: “It’s very seldom that publishing compensation accomplishes much for the shareholders. American shareholders are paying a significant price for the fact that they get to look at that proxy statement each year and see how much those top five officers are earning ... At Salomon (where Buffett was CEO in the past), virtually everybody was dissatisfied with what they were getting paid, and they were getting paid enormous amounts of money. They were disappointed, not because of the absolute amount — they were disappointed because they looked at somebody else in the place and it drove them crazy. More transparency can create an arms race, which produces astronomical compensation for CEOs. I would put it this way, CEOs, as a group, would be being paid a lot less money if proxy statements hadn’t revealed how much other people were getting paid.”

Microsoft. An American multinational technology company, Microsoft develops, manufactures, licenses, supports, and sells computer software, consumer electronics, personal computers, and related services. Its best known software products are the Microsoft Windows line of operating systems, the Microsoft Office suite, and the Internet Explorer and Edge web browsers. Microsoft is ranked No. 30 in the 2018 Fortune 500 rankings of the largest United States corporations by total revenue.

Microsoft was founded by Bill Gates and Paul Allen in 1975 and rose to dominate the personal computer operating system market. The company's 1986 initial public offering (IPO) and subsequent rise in its share price created three billionaires and an estimated 12,000 millionaires among Microsoft employees. It has increasingly diversified from the operating system market and has made a number of corporate acquisitions, their largest being the acquisition of LinkedIn for \$26.2 billion in December 2016, followed by their acquisition of Skype Technologies for \$8.5 billion in May 2011.

The company produces a wide range of other consumer and enterprise software for desktops, laptops, tabs, gadgets, and servers, including Internet search (with Bing), the digital services market (through MSN), mixed reality (HoloLens), cloud computing (Azure), and software development (Visual Studio).

In 2018, Microsoft surpassed Apple Inc. as the most valuable publicly traded company in the world after having been dethroned by Apple in 2010. In April 2019, Microsoft reached the trillion-dollar market cap, becoming the third U.S. public company to be valued at over \$1 trillion after Apple and Amazon respectively. Microsoft is the world's most valuable company.

According to its SEC filing of October 16 2019, Microsoft has some 144,000 employees and pays a median salary of \$172,512 to its employees for a payroll of \$24.8 billion, estimated at the median salary. CEO Satya Nadella is paid a salary of \$42.9 million, which implies a CEO pay ratio of 249, a CEO pay per employee of \$298 and a B-ratio of 0.17%.

Walmart. An American multinational retail corporation, Walmart is a publicly traded family-owned business that operates a chain of hypermarkets, discount department stores, and grocery stores. As of October 31, 2019, Walmart has 11,438 stores and clubs in 27 countries, operating under 55 different names and has wholly owned operations in Argentina, Chile, Canada, and South Africa.

Walmart is the world's largest company by revenue, with US\$514.4 billion, 65% of which from the US, according to the *Fortune* Global 500 list in 2019. Walmart's investments outside the U.S. have seen mixed results. Its operations and subsidiaries in Canada, the United Kingdom, Central America, South America and China are highly successful, whereas its ventures failed in Germany and South Korea.

Walmart has been criticized by groups and individuals, including labor unions and small-town advocates protesting against Walmart policies and business practices and their effects. Criticisms include charges of racial and gender discrimination, foreign product sourcing, treatment of product suppliers, environmental practices, the use of public subsidies, and the company's spying on its employees. Walmart denies any wrongdoing and says that low prices are the result of efficiency.

According to its SEC filing of April 20 2018, Walmart has 2.2 million employees, the largest private employer in the world, and pays a median salary of \$21,952 to its employees for a payroll of \$48.3 billion, estimated at the median salary. Its CEO is paid a salary of \$23.6 million, which implies a CEO pay ratio of 1076, a CEO pay per employee of \$11 and a B-ratio of 0.05%. This is an example of why one cannot simply look at the CEO pay ratio.

McDonald's. This American fast food company was founded in 1940 as a restaurant operated by the McDonald brothers. They rechristened their business as a hamburger stand, and later turned the company into a franchise, with the Golden Arches logo being introduced in 1953. In 1955, Ray Kroc, a businessman, joined the company as a franchise agent and proceeded to purchase the chain from the McDonald brothers. McDonald's is the world's largest restaurant chain by revenue, serving over 69 million customers daily in over 100 countries across 37,855 outlets as of 2018. The McDonald's Corporation revenues come from the rent, royalties, and fees paid by the franchisees, as well as sales in company-operated restaurants.

According to its SEC filing of March 22 2019, McDonald's has 210,000 employees (1.7 million worldwide) and pays a median salary of \$7,473 to its employees for a payroll of \$1.6 billion, estimated at the median salary. Its CEO Chris Kempczinski is paid a salary of \$15.9 million, which implies a CEO pay ratio of 2124, a CEO pay per employee of \$76 and a B-ratio of 1.01%.

Waste Management Inc. An American waste management, comprehensive waste, and environmental services company founded in 1968, Waste Management operates a network of 346 transfer stations, 293 active landfill disposal sites, 146 recycling plants, 111 beneficial-use landfill gas projects and six independent power production plants. Waste Management offers environmental services to nearly 21 million residential, industrial, municipal, and commercial customers in the United States, Canada, and Puerto Rico. With 26,000 collection and transfer vehicles, the company has the largest trucking fleet in the waste industry.

Together with its competitor ***Republic Services, Inc.***, the second largest provider of non-hazardous solid waste collection, transfer, disposal, recycling, and energy services in the United States as measured by revenue, the two handle more than half of all garbage collection in the United States.

The third largest North American integrated waste services company is ***Waste Connections***, which provides waste collection, transfer, disposal and recycling services, primarily of solid waste in the United States and Canada. It most often does this through contracts with municipalities to collect the waste in that municipality, for an agreed-upon rate. It also provides services directly to residential, commercial, or industrial customers. In addition, Waste Connections runs landfills for waste disposal (82 solid waste landfills as of September 2019). In Q3 2017, 67% of revenue was from solid waste collection, 21% from solid waste disposal and

transfer, 4% from recycling, 5% from its oil industry waste operations, and 3% from other sources. Globally, 16% of revenue was from Canada, with the rest from the United States.

According to its SEC filing of March 27 2019, Waste Management Inc. has 43,700 employees and pays a median salary of \$81,096 to its employees for a payroll of \$3.5 billion, estimated at the median salary. Its CEO James C. Fish Jr. is paid a salary of \$9.1 million, which implies a CEO pay ratio of 113, a CEO pay per employee of \$209 and a B-ratio of 0.26%.

Cabot Oil & Gas and *Realty Income Corp.* We regroup these two smaller firms because they represent relatively standard CEO pay ratios but relatively extreme CEO pay per employee and B-ratios.

Cabot Oil & Gas is a company engaged in hydrocarbon exploration. The company had in December 2018 some 11.6 trillion cubic feet equivalent of proved reserves, all of which was natural gas and all of which was in the Marcellus Shale,⁴ where the company controls approximately 174,000 net acres. The company was cited in 2009 for violations in regard to spills of toxic hydraulic fracturing fluids in Northeastern Pennsylvania, and cited in 2012 for improper well construction as a result of polluted drinking water.

According to its SEC filing of March 19 2019, Cabot Oil & Gas has 303 employees and pays a median salary of \$82,714 to its employees for a payroll of \$25.1 million, estimated at the median salary. Its CEO Dan Dinges is paid a salary of \$13.1 million, which implies a CEO pay ratio of 158, a CEO pay per employee of \$43,070 and a B-ratio of 52.07%.

Realty Income Corp. is a real estate investment trust that invests in free-standing, single-tenant commercial properties in the United States, Puerto Rico, and the United Kingdom that are subject to net leases, under which the tenant rather than the landlord is responsible for property taxes, insurance and/or maintenance. The company uses cash to purchase land needed for stores that require real estate to run, and then leases the property to the stores long term.

According to its SEC filing of March 15 2019, Realty Income Corp. has 165 employees and pays a median salary of \$97,630 to its employees for a payroll of \$16.1 million, estimated at the

⁴ The Marcellus Shale is a Middle Devonian age unit of sedimentary rock found in eastern North America and extending throughout much of the Appalachian Basin.

median salary. Its CEO Sumit Roy is paid a salary of \$8.1 million, which implies a CEO pay ratio of 83, a CEO pay per employee of \$48,816 and a B-ratio of 50.00%.

General Motors. An American multinational corporation founded in September 1908, General Motors designs, manufactures, markets, and distributes vehicles and vehicle parts, and sells financial services. It is the largest American automobile manufacturer and one of the world's largest, and is ranked #10 on the Fortune 500 rankings of the largest United States corporations by total revenue. General Motors manufactures vehicles in 37 countries and does business in 140 countries. Its core automobile brands include Chevrolet, Buick, GMC, and Cadillac, but it also either owns or holds a significant stake in foreign brands such as Holden, Wuling, Baojun, and Jiefang.

General Motors holds a 20% stake in IMM, and a 77% stake in GM Korea. It also has a number of joint-ventures, including Shanghai GM, SAIC-GM-Wuling and FAW-GM in China, GM-AvtoVAZ in Russia, GM Uzbekistan, General Motors India, General Motors Egypt, and Isuzu Truck South Africa.

The recent history of General Motors has been somewhat hectic. Amidst the financial crisis and economic recession of the late 2000s, General Motors was forced into bankruptcy in June 2009. A “new GM” corporation was created owned by the United States government with a 60.8% stake, the federal government of Canada and provincial government of Ontario with an 11.7% stake, the Auto Workers unions VEBA fund with a 17.5% stake, and the unsecured bondholders of General Motors with a 10% stake. General Motors had received \$51 billion from the US Treasury or 79.8% of the amount disbursed under the automotive industry financing program. The US Treasury completed the sale of all its GM stocks and warrants in December 2013 for a total of \$39 billion, hence incurring a loss of \$12 billion.

According to its SEC filing of April 18 2019, the “new” General Motors has 173,000 employees and pays a median salary of \$77,849 to its employees for a payroll of \$13.5 billion, estimated at the median salary. Its CEO Mary Bara is paid a salary of \$21.9 million, which implies a CEO pay ratio of 281, a CEO pay per employee of \$127 and a B-ratio of 0.16%.

III. The value of management (CEO)

Why are CEOs paid such large absolute amounts in salaries, namely \$14.2 million on average over the 500 firms considered here?

The Corporate Finance Institute states that the roles and responsibilities of a CEO vary from one company to another, depending in part on the organizational structure and/or size of the company. In larger companies, the CEO only deals with “high-level corporate strategy and major company decisions.” The typical duties, responsibilities, and job description of a CEO include, among others: leading the development of the company’s short- and long-term strategy; maintaining awareness of the competitive market landscape, expansion opportunities, and industry developments; assessing risks to the company and ensuring they are monitored and minimized; and setting strategic goals and making sure they are measurable and describable.

In other words, the CEO personifies first and foremost the design, development, and management of the firm’s real options.

The real options approach (Boyer, Christoffersen, Pavlov, and Lasserre 2004)

The real options approach considers strategic management and decision-making as a process aimed at actively reducing exposition to downside risk and promoting exposition to upside opportunities. It stands at the hinge between pure finance and other areas of decision making under risk such as project evaluation, market entry and exit, organizational restructuring and re-engineering, technology adoption, climate change and biodiversity decisions, etc.

The approach underlines a frame of mind and uses methodologies that appeal to a wide array of managers, thus providing a common language, thereby meeting a critical responsibility of the CEO. Real options have applications in many areas that are central to modern corporations: market coverage and development, finance, human resources management, technology management, R&D and knowledge management, etc.

Thinking in terms of real options represents a major development in strategic but remains relatively unknown in spite of its adoption by many large firms worldwide. Nonetheless, as shown in the academic literature and as argued in some of the quotes below, the contribution of higher level managers to the value of a firm lies in the creation and the exercise of real options. Indeed, the value of strategic management, and the CEO in particular, can be assessed that way.

At a more macroeconomic level, the efficiency of financial systems rests primarily on proper risk assessment and management in project evaluation. The real options approach is the crucial analytical tool to fulfill such a need and act as a link between the financial and the real sectors.

Some quotes from the business press:

- “The oil, energy and pharmaceutical industries have long used the real options framework to assign value to non-financial assets like R&D projects and oil leases. ‘Real options prices the value of an opportunity,’ says Brice Hill, controller in the server division of Intel Corp. in Hillsboro, Ore. And companies can use a real options valuation to determine how much they are willing to spend to create an option on a particular opportunity. ‘It used to be that any level of investment was appropriate to create a strategic option,’ says Hill. ‘But now if an option has a specific value -- say, \$50 million - then a company might be willing to spend up to \$50 million to create that option.’”
(Business Finance)
- “Real-options analysis rewards flexibility and that’s what makes it better than today’s standard decision-making tool, ‘net present value.’ NPV calculates the value of a project by predicting its payouts, adjusting them for risk, and subtracting the investment outlay. But by boiling down all the possibilities for the future into a single scenario, NPV doesn’t account for the ability of executives to react to new circumstances, for instance, spend a little up front, see how things develop, then either cancel or go full speed ahead.”
(Business Week)⁵
- “The real option approach emphasizes that many investments create important, follow-on opportunities that a company may or may not subsequently exploit. Consequently, the real option approach highlights value that is contingent on earlier investments. For instance, while a given R&D investment may have a very low or even negative net present value, it may also provide platforms for future, favorable investments. Real options bear some

⁵ See also Boyer, M. et alii (2017), *Advanced Methods of Investment Evaluation / Méthodes avancées d’évaluation d’investissement*, Monographie CIRANO Monograph, Hiver/Winter 2017, 601 pages (2 Volumes) available at: <http://cirano.qc.ca/files/publications/2017MO-03.pdf> , <http://cirano.qc.ca/files/publications/2017MO-04.pdf>.
And Boyer, M. (2019), « Erreurs méthodologiques dans l’évaluation des projets d’investissement », *Revue Française d’Économie* XXXIII (2018/4), avril 2019, 49-80. <https://www.cairn.info/revue-francaise-d-economie-2018-4-page-49.htm>

other similarities to financial options. For example, the value of both types of options increases with uncertainty. Further, by providing managers discretion - rights but not obligations – financial and real options can help companies limit their downside risk while also gaining access to upside opportunities in the future. However, unlike financial options, real options come into existence by the opportunities created by the company's strategic investments. Because their underlying assets do not trade in liquid markets, real options also present unique valuation challenges.” (Financial Times)

- “Real options valuation grounds strategic thinking and decision-making in concrete financial analysis. ‘When companies make strategic investments, they tend to do so with a thumbs up or thumbs down from the CEO and no financial analysis to the decision,’ says John McCormack, senior vice president and head of the energy practice at Stern Stewart & Co., a management consultancy in New York City. ‘But when you have strategic investments that require choices in the future,’ real options can guide those decisions. The model also enables an organization to recalculate the value of a project or investment as it progresses and to understand what must happen before the project or investment can move successfully into the next stage of development. (Business Finance)
- “Exploit hidden assets and you will succeed. Neglect them and you will wind up with a collection of old nags. What kind of hidden assets do I mean? For example, the unexploited opportunities to add a new product line, expand overseas or engage in e-commerce are hidden assets that do not appear on a company's financial statements and have not yet contributed to its profits. When you buy a company, you often get these features for free. I call them ‘real options,’ an analogy to the financial options traded in Chicago. There's a big difference, though. Financial options remain valuable when held by passive investors. But owning a business is not a passive exercise. The owner has a real job to do, providing governance, managing capital and helping a business achieve its potential.” (Forbes magazine)
- “Real options analysis is based on the observation that a company evaluating an existing asset or potential investment is in much the same position as the holder of a financial option. The holder of a financial put option on, say, the price of oil can exercise that option if the price rises above a pre-agreed level, but doesn't have to if the price falls. Similarly, the owner of a marginally profitable oil field has the right to exploit it if the

price of oil rises, but is not obliged to do so if it doesn't. That observation leads to the assumption that the future value of such an investment can be best valued in a similar way to financial options, rather than by simply discounting the cash flows expected from it in future. In particular, option valuation takes into account the risks and rewards of future uncertainty, or volatility, which traditional discounted cash flow (DCF) models do not.” (CFO Europe)⁶

- “To evaluate potential projects, they almost invariably have to resort to a theory of corporate finance called the ‘Capital Asset Pricing Model’ (CAPM). Yet real-life managers tend not to like this model, for the simple reason that it ignores the value of real-life managers. In the ivory tower, they are talking about ditching the CAPM for a rival, called “real options theory”, that places managers at its very core. More fundamentally, the flaw in the CAPM is that it implicitly assumes that when firms buy new assets, they hold these passively for the life of the project. But they do not. Instead, they employ managers precisely in order to react to events as they unfold. Obviously, this managerial flexibility must be worth something. Options on “real” assets (and indeed poker bets) behave rather like options on financial assets (puts and calls on shares or currencies, say). The similarities are such that they can, at least in theory, be valued according to the same methodology. There is a snag, of course: sheer complexity. Pricing financial options is daunting, but valuing real options is harder still. Their term, unlike that of financial options, is usually open-ended or undefinable. The volatility of the underlying asset can be difficult to measure or guess, especially since it is not always clear what it is - if, for example, it is yet to be invented. How can one define the appropriate benchmark asset-class in the case of a new drug for a rare disease? And there may be additional variables to consider, such as the strategic benefit of pre-empting a rival.” (The Economist)

The real options approach does not pretend to be and will not become a substitute for proven business values and virtues. A better appreciation and exploitation of risks and opportunities will

⁶ See Boyer, M., Gravel, É., “Évaluation options réelles du projet VEGA de Northern Canada Gas”, CIRANO 2012s-26, 63 pages. <https://cirano.qc.ca/files/publications/2012s-26.pdf>

neither completely shield a firm from the dangers inherent to business nor fully protect it from the temptations of fraudulent behavior.

As a direct outgrowth of finance, the real options approach uses techniques and methodologies which prevail in that field. However, finance is mostly preoccupied with evaluating and pricing financial instruments, among them put and call options of many sorts. As the real options approach percolates into various areas of management and decision making, there is a shift of emphasis from pure evaluation to decision analysis and optimization.

The origin of the real options approach can be traced back to the remark by Steward Myers of MIT that holding a real investment project like the construction of a plant (or the adoption of a new technology, a restructuring plan, the exploration of a new market or product, the development of an R&D program) was formally similar to holding a financial call option. A real investment project involves the option, but not the obligation, to spend resources at some future time in order to obtain an asset (an operating plant) whose value is normally stochastic. The randomness of a financial option arises from the fact that the underlying asset is usually a stock, so that, at the time the option is acquired, it is not clear whether the known exercise price will be lower or higher than the still unknown stock price in the future; thus the option may never be exercised. Similarly, if the price of the projected plant's output does not evolve favorably, or if further future research reveals that operating costs would be high, then it may not be worthwhile completing, that is engage in the n -th stage, or exercising the plant construction option.

The distinction between option evaluation and decision making is only a matter of emphasis. In fact, evaluation requires solving the decision problem raised by the option: should it be exercised and when? But the distinction is important: it underlines that good decision making creates value. As we argue below, the objective of applying the real options approach to decision making in organizations is to create value by capturing the full value of the firm's potential. This approach brings the strong discipline of finance into other areas of corporate planning activities, of public policies, and of individual endeavors.

Another difference between financial options and real options arises from the nature of the uncertainty affecting the underlying asset. In the world of financial options, uncertainty is all about future stock prices. Uncertainty is then a source of value because of the limited downside and unlimited upside fluctuations of the pay-off, fluctuations that are linked to the exogenous

(outside the control of the managers) variability or volatility of the price of the underlying financial assets.

In the world of real options, uncertainty has value because of the ability of higher executives to manage the uncertainty of projects. In a world without uncertainty, managers would not be needed. Chief executive officers add value to the firm because they actively manage change as uncertainty unfolds over time. In a sense, the real options approach attempts to quantify that value, that is, the value of active management of uncertainty by managers, and the CEO in particular. This crucial difference in the nature of uncertainty has its counterpart in the nature of the information that needs to be used for option evaluation and management. For financial options, most of the time long and frequent data series are available about stock prices. For a real option such as the construction of a production plant, the uncertainty arises from future prices or production costs. While product prices may have some similarity with stock prices, they are not usually recorded with the same accuracy, nor are they driven by the same factors. When it comes to costs evaluation, both the form and the nature of the data available are fundamentally different.

There are also differences in the institutional environment characterizing the option evaluation and decision making problem. An important one is that financial markets are often rich and dense enough that appropriate portfolios of existing traded assets can duplicate the risks associated with the asset underlying a particular option. It is under such circumstances that the celebrated Black-Scholes-Merton approach is applicable. In the case of many real options, this so-called ‘spanning’ assumption cannot be invoked because markets are thin and opaque so that other techniques, such as stochastic dynamic programming, must be used instead of the contingent claims approach prevalent in financial applications.

Although widely used in finance, techniques such as stochastic dynamic optimization are by far not specific to that field. Being used by managers and engineers as well, they often constitute a common tool and language by which real options techniques and methodologies are spreading more easily from finance into other areas.

Certainly, the technical dimension of option evaluation is important and is part of the conceptual breakthrough that was recognized by the 1997 Nobel prize in economic sciences awarded to Robert C. Merton and Myron S. Scholes “for a new method to determine the value of derivatives.”

But beyond techniques, the real options approach is mostly a way of thinking and adjusting one's behavior accordingly. Its application throughout the firm is a responsibility of the CEO. It rests on the explicit

- recognition that uncertainty creates opportunities and value;
- recognition that such value requires adequate decisions in order to materialize;
- identification of the sources of uncertainty and collection of information;
- identification of the decisions (options) that promote exposition to favorable outcomes;
- identification of the decisions that reduce exposure to downside risk;
- design of optimal decision *rules*.

Project evaluation in a broad sense is the most obvious application of the real options approach, although by no mean the only one or the major one. Before the real options approach, the standard evaluation procedure was discounted net present value (NPV). The real options approach is best seen as an improvement to conventional discounted net present value determination; it does not invalidate the procedure but amends the way it is applied. In fact, the real options approach rationalizes what many CEOs as well as high and middle managers are already doing on intuitive grounds:

- attach importance to the timing of decisions;
- identify and evaluate downside risks and upside opportunities associated with the project;
- identify, evaluate, and optimize future decisions that may affect exposition to downside or upside fluctuations;
- to sum up: optimally manage the creation and use of flexibility as a device to exploit uncertainty.

Once these dimensions of the project are introduced, projects become proactive instruments that modify the way uncertainty affects results in the decision maker's favor. Proper evaluation of costs and benefits always was crucial in conventional net present value evaluation. In a real options approach, costs and benefit evaluation becomes more difficult but more realistic. Options created by the project now enter as benefits; options used up or exercised by the project enter as costs. In both cases these options must be valued and in most cases such evaluation involves finding the optimal way to decide whether and when an option must be created (bought), held, or used up.

A real options approach helps executives quantify the value of active management (CEO). Since the conventional NPV calculations typically are based on the discounted value of *average* outcomes, the ability of executives to actively manage a project is not accounted for and therefore the conventional NPV will typically underestimate the true NPV of a project. Active management limits the downside and enhances the upside of the distribution of the NPV outcomes and can even change the expected NPV from negative to positive. Moreover, the ordering of mutually exclusive projects or strategies may not be the same.

In fact, the real options approach rationalizes, structures, and makes more rigorous the so-called “gut feeling” effect. The upshot is that if the conventional NPV approach is taken, then truly profitable or more profitable projects and strategies are not implemented causing shareholder value of the firm to be less than maximal.

The real options approach may bring the discipline and accuracy of finance into various areas of decision-making. The approach is relevant to a very large array of management and strategic decisions involving uncertainty and irreversibility. This is why many pioneer firms are starting to use it to take better advantage of a proactive type of management and create value.

Implementing a real options approach is not easy however. The standard procedures used in finance must often be adapted or replaced with other techniques. Each application of the real options approach is likely to be context specific. The available options must be envisaged and described; the relevant information must be identified and collected carefully; the executive using a real options approach must have the required knowledge and training to adapt standard procedures to each particular situation. Perhaps most importantly the real options approach is a state of mind, a capacity and willingness to detect decisions that create opportunities or protect against mishaps, and act upon them in order to create value for the firm. The role of the CEO in shaping such a culture cannot be underestimated.

For managers with such a state of mind, the real options approach is a tool that allows them to bring intuition in line with the prescriptions of rigorous decision-making procedures. More

importantly it allows them to give a more accurate quantitative content and value to intuitive rules, thus gaining an edge over competitors.⁷

The implementation of a real options approach could be very valuable but at the same time is a challenging task. However, it is very much in the spirit of real options to finish with a sobering quote from before the Enron debacle:

- “Enron President and Chief Operating Officer Jeffrey K. Skilling (credited) real options thinking with helping Enron transform itself from a U.S. natural-gas pipeline company into a global wheeler-dealer that trades commodities including gas, electricity, water, and, most recently, telecom bandwidth.” (Business Week 1999)

Indeed, a bad CEO could be extremely detrimental to the wellbeing of all stakeholders, workers, managers, shareholders, suppliers and customers. Numerous examples could be given but let us mention five particularly striking cases from Emma Woollacott, “Lessons from history’s worst CEOs,” *Chief Executive Magazine*, July 18, 2018.

In the words of Emma Woollacott, “One of the markers of a good business leader is a desire to constantly learn and improve. As a result, there’s a huge market for self-improvement – from CEO autobiographies to TED Talks to books on management and achievement. But how much can you really learn from success? Take Steve Jobs, who built the massive Apple empire from scratch, for example. Can we identify the crucial factor to his success? Was it his powerful drive? His marketing savvy? Or something completely different? The causes of failure, on the other hand, can be a lot easier to pinpoint, especially when they bring a previously successful organisation down. And while it’s a truism that we learn best from mistakes, those mistakes don’t have to be our own.”

Let us briefly consider some of those she considers “the worst CEOs in history.” The description is hers.

⁷ In a truly strategic context, where decision-makers are optimizing in a reactive environment (competitors), the value added nature of a real options approach is even more striking, although quite different from the financial options contexts. See chapter 20 (volume 2) in Boyer, M. et alii (2017), *Advanced Methods of Investment Evaluation / Méthodes avancées d'évaluation d'investissement*, Monographie CIRANO Monograph, Hiver/Winter 2017, 601 pages, available at: <http://cirano.qc.ca/files/publications/2017MO-04.pdf>.

- “Kay Whitmore (Eastman Kodak). This story is one of complacency and lack of vision. In 1990, Kay Whitmore’s first year as CEO of Kodak, he famously fell asleep in a meeting with Bill Gates at which integrating the company’s products with Windows was being discussed. Indeed, despite the fact that Eastman Kodak had actually developed the digital camera in 1975, Whitmore refused to take the technology seriously and failed to invest. As digital started to take over the world, the company fell into decline. Whitmore was fired after three years, mainly for failing to cut costs enough. Lesson: Whitmore’s background was squarely in film, and he failed completely to see the opportunities in the digital world.
- “Carly Fiorina (HP). When Carly Fiorina became CEO of HP in 1999, she described herself as a ‘change agent’ – and change the company she certainly did. By the time she left six years later, HP had lost half its value and thousands of staff, although Fiorina still paid herself plenty. Poor decisions included trying to buy PricewaterhouseCoopers for US\$14 billion; after she was dissuaded, it went to IBM for less than US\$4 billion. Meanwhile, a merger with Compaq was widely seen as a disaster. The day Fiorina was fired, HP’s market value increased by US\$3 billion. Lesson: Fiorina antagonised workers and investors alike while apparently never doubting her own rightness. Listen to those around you.
- “Warren Anderson (Union Carbide). Warren Anderson was CEO of US chemical company Union Carbide when a plant in Bhopal, India, leaked more than 40 tons of poisonous gas into the surrounding city, killing several thousand people and seriously harming hundreds of thousands more. While Anderson had the fortitude to visit Bhopal a few days later, he fled after being arrested and released on bail, never to return. The company claimed that the accident was caused by a disgruntled employee, and that the Indian government was at fault for allowing people to live so close to the site. But Anderson himself admitted that the plant did not have the same safety standards as those in the US. Lesson: Anderson was apparently devastated by the disaster, but the fact remains that the buck stops at the top.
- “John Sculley (Apple). John Sculley was hired away from PepsiCo for his business experience and marketing skills – but ended up forcing out Steve Jobs, who had not only recruited him but was undoubtedly the real driving force behind the company.

Sculley is said to have seen Jobs, a superb marketer himself, as a rival. Sculley lacked real technical knowledge and made a number of shaky product decisions, including launching the Apple Newton and moving into the camera and CD player businesses. In the end, of course, Jobs was brought back; by then, Sculley had been fired after a decade of problems. Lesson: Don't let your emotions lead you into making poor decisions.

- “Ken Lay (Enron). There's an element of Greek tragedy about the rise and fall of Ken Lay. Under his leadership, energy giant Enron grew into a US\$100-billion business – before losing 99.7% of its value in 2001. Lay scores double points as a disastrous CEO, displaying incompetence as well as dishonesty. Uninterested in the day-to-day running of the company, he gave free rein to a couple of distinctly dodgy subordinates. As the company faltered, he signed off on a massive accounting fraud designed to inflate the firm's financial health. Lay died of a heart attack in July 2006, shortly before being sentenced, but it had been expected that he'd get up to 30 years in prison for his part in the deceit. Lesson: Enron's corporate culture was focused on increasing revenue at all costs. Make sure you aren't incentivising a lack of ethics.
- “Gerald Ratner (Ratners Group). This CEO and Chairman only really made one mistake but boy, was it a big one; so big, in fact, that it's now known as the Ratner Effect. In a magazine interview, Gerald Ratner, of the eponymous jewellery company, described a cut-glass sherry decanter set sold in his shops as “total crap” and went on to insult other products too. Customers fled, and millions of pounds were wiped off the value of the business. Ratner hired a new chairman, who went on to fire him. Lesson: Always treat your customers with respect.
- “Chen Jiulin (China Aviation Oil). For a long time, Chen Jiulin was hailed as a superb managing director and CEO; under his leadership, China Aviation Oil's net asset worth rose by an extraordinary 85,200% to US\$150 million. However, speculative oil price trading nearly brought the company down and Chen tried to hide what had happened. In 2006, he was sentenced to four years and three months in jail after failing to disclose a US\$550 million trading loss. Lesson: Don't gamble with your company's assets; it always ends in tears.

The message: make sure that you hire a good if not excellent CEO. The CEO can have a significant impact on the future of your firm, in particular its profitability, sustainability, growth, job creation, and productivity gain record (hence salary gains), and, in so doing, to protect your job, now and in the future, including your pensions. Hence the importance of properly informing or framing the question regarding the CEO pay.

Understanding the value and compensation of CEOs

In their study on the underlying factors of managerial compensation across industries and countries, Christoffersen and Pavlov (2003) write: “[M]anagers in different countries and industries are compensated very differently, not necessarily because their skills differ substantially, but rather because the scope for management to add value to the firms varies substantially.” The authors consider “a continuous time model of the firm, where the economic environment evolves stochastically over time and where changes to the firm operations are costly.”

The underlying idea is that if adjustment costs are low and/or if the economic environment is relatively volatile, then the potential CEO impact through value-added active management is larger. The positive relationship between the volatility of the economic environment volatility and the value of the CEO suggests a real options interpretation of the CEO management role. Active management and leadership by the CEO means optimally exercising the firms’ real options, that is, making timely changes in the firm’s strategies, operations, investments, and risk management in reaction to changes in the firm’ environment: the higher the volatility of the firm’s environment and the economy, the larger the potential value of the CEO.

In addition to the overall success of an organization or company, the CEO is responsible for leading the development and execution of long-term strategies, with the goal of increasing shareholder value.

The variation in managerial compensation across countries is important. According to the BBC News Service citing Bloomberg sources,⁸ the U.S. “CEO to average worker pay ratio” and the “Annual CEO wage” were respectively 265 and \$14.25M (million) in 2018. The corresponding

⁸ Fernando Duarte 9 Jan 2019 <https://www.bbc.com/worklife/article/20190108-how-long-it-takes-a-ceo-to-earn-more-than-you-do-in-a-year>

numbers for other countries were: India 229, \$1.16M; UK 201, \$7.95M; South Africa 180, \$2.21M; Netherlands 171, \$8.24M; Switzerland 152, \$8.5M; Canada 149, \$6.49M; Spain 143, \$4.89M; Germany 136, \$6.17M; China 127, \$1.87M; South Korea 66, \$2.32M; Mexico 62, \$1.29M; Sweden 60, \$2.79M; Singapore 56, \$4.62M.

Christoffersen and Pavlov provides some common sense arguments that suggest a number of explanations for this disparity. The following explanations are taken *passim* from their paper.

First, the cost of living and the quality of life in general: higher compensation in some countries reflects the higher cost of living. Abowd and Kaplan (1999), among others, address this potential explanation and show that the CEO pay in various OECD countries varies substantially even after adjusting for purchasing power parity exchange rates.

Second, CEOs in high-income countries are paid more simply because everybody in those countries is paid more. While this is a very appealing argument supported by anecdotal evidence, it turns out that midlevel managers pay and manufacturing operatives pay are substantially less variable across countries than the CEO compensation. The disparity in the international compensation puzzle thus largely appears to be a CEO phenomenon.

Third, it is conceivable that the variation in CEO pay is due to different taxation and the after-tax income is comparable. Christoffersen and Pavlov show that the after-tax CEO pay varies also greatly across countries. They conclude that international variation in CEO pay is clearly not explained by differences in tax rates.

Fourth, disparity is temporary and CEO pay will converge over time. Again, data suggest that the variation in CEO pay is consistent through time. Christoffersen and Pavlov claim that there is no evidence that the CEO pay across countries is converging over time.

Fifth, disparity in CEO compensation corresponds to difference in competencies. Christoffersen and Pavlov claim that “the compensation puzzle becomes even more intriguing when one considers the widespread phenomenon that the CEOs in the largest companies around the World tend to go to the same business schools in North America and Europe. Taking this feature to the extreme, we can consider managers across countries and industries to have roughly the same skills, yet they get paid very differently.”

Sixth, there remains “the possibility that the variation in CEO compensation may arise from the varying business environments in different industries and countries. Traditional models of managerial compensation largely rely on principle-agent settings, where the manager extracts rents from the company owners’ inability to observe managerial effort.” Christoffersen and Pavlov see the principle-agent models as useful for many purposes, but they claim that they do not appear to provide insight into the cross-country and cross-industry variation in managerial compensation: “It is hard to imagine that principle-agent problems are so much worse in the US than in New Zealand that they explain a six-fold difference in managerial compensation for similar-size companies.”

Christoffersen and Pavlov use the tools from the options compensation literature to “focus on the differences in the business environments in which CEOs operate, and it is therefore useful to consider the avenues through which a CEO can add value to a company.” They group these sources of value into the following broad areas:

- Expansion of market opportunities
- Investment in new products and technologies
- Managing uncertain demand
- Production management in the face of uncertain technologies
- Managing the inputs to the production

Each of these may be country-specific, but Christoffersen and Pavlov focus on the last one. They show that the value of a CEO, hence his/her compensation, is “related to the management of the optimal composition of inputs into the production of the output of the firm”, which is continuously changed by the manager as the relative prices of the inputs change. Hence, “the scope for managing the production plan is largest in countries or industries where the input prices are the most volatile and where the adjustment costs are the smallest.”

Christoffersen and Pavlov develop a simulation model that “predicts that managerial compensation, for example, will be highest in countries with a low degree of unionization, and in countries with open capital markets. Implicitly, the model also predicts that if over time countries become decreasingly unionized and capital markets increasingly liberalized, then differences in CEO pay across countries should decrease.”

In a different context and line of research, Boyer, Boyer and Garcia (BBG, 2013) consider the firm as a nexus of activities and projects and propose a characterization of the firm where variations in the market price of risk induce desirable but difficult adjustments in the firm's portfolio of projects. In a setting where managers disagree with respect to what investments maximize value, changing the portfolio of projects generates coordination costs between senior operations managers and (real) risk managers.

Although BBG consider the role of financial risk management in allowing the resolution of conflicts and thereby favoring value maximizing changes in the firm's portfolio of operations and real risk management activities, it is possible to reinterpret their results in terms of how important is the role of the CEO, hence his/her compensation.

BBG show that the use of financial derivatives reduces coordination costs by moving the organization's cash flows expectations and risks toward a point where coordination in favor of real changes is easier to achieve. They find empirical support for this new rationale for the use of financial derivatives, after controlling for the traditional variables explaining the need for financial risk management.

In the context of assessing the value of CEOs, we saw how Christoffersen and Pavlov link the capacity of the CEO to modify the production plan of the firm in reaction to changes in relative input prices. Two factors favor a higher value for the CEO: the volatility of the environment (in input prices) and the costs of inducing changes, in particular but not only the restrictions imposed on the CEO freedom to act (for instance through a high rate of unionism).

In the BBG context, it is the direct use by the CEO of financial and real options instruments that allow more and better coordination at lower costs towards value enhancing changes in the firm's portfolio of activities, strategies and projects following changes in the market price of risk.

Indeed, changing the portfolio of projects is in general difficult and costly since it means that the firm's specialists, plant or division operations and risk managers, must agree and coordinate their efforts to alter the mix, thus creating conflicts if the specialists do not have the same information or objective.⁹

⁹ Through discussions with senior corporate executives, BBG were comforted in the idea that coordination problems associated with major strategic activities, decisions, and investments were tackled by high-level committees

BBG derive the prediction that the use of financial instruments will be more pronounced when the transformation possibility frontier (between the riskiness and expected value of project cash flows) is such that a small movement in the market price of risk will lead to important adjustments in the firm's strategic portfolio of projects, a concept that they name reactivity. To test the model, they collected information for 269 large US firms for the years 1993 to 2004.

They show that there is a strong relationship at the industry level between the level of reactivity and the use of financial derivative instruments and that, using firm level data, reactivity has a significant positive impact on the number of risks that a firm manages using financial derivatives.

Their results are indeed consistent with Stulz's (1996) observation that "Perhaps more puzzling, however, is that many companies appear to be using [financial] risk management to pursue goals other than variance reduction" and Guay and Kothari (2003) suggesting that firms may be "using derivatives for purposes other than those predicted by traditional risk-management theory."

Given market conditions, all feasible combinations of projects and activities can be valued to identify the combination that maximizes firm value. As a result, firm value is determined by the portfolio of projects and activities and the market price of risk. As the market price of risk changes, a firm must adjust its portfolio of projects, thereby changing its aggregate distribution of cash flows, to achieve a new optimal position on its transformation possibility frontier.

Depending on the shape of this frontier, the adjustments will be more or less pronounced.

Movement towards the new optimal combination of projects may lead to disagreements between specialized functional managers or business units, given their respective specific objectives. We argue that the use of financial instruments act as a managerial-conflict resolution tool, thereby giving the financial risk manager a role as facilitator within the firm.

In our present case of CEO value-enhancing role, we would predict that the CEO value and hence the CEO compensation would be related to the shape of the transformation possibility frontier (between the riskiness and expected value of project cash flows): when a small movement in the

involving senior executives from different business units, firm-wide management functions, and board representatives. A consensus must be reached before the reviewed investments, actions, and changes in activities can be pursued and implemented. Similar issues are also highlighted in *The Renewed Finance Function - Extending Performance Management Beyond Finance*, CFO Research Services, CFO Publishing Corporation, November 2007.

market price of risk induces important adjustments in the firm's strategic portfolio of projects, the value of CEO as facilitator of changes is higher, hence his/her compensation.

In such a context, the key role of the CEO is to alleviate problems related to the distribution, communication, and processing of information (Bolton and Dewatripont 1984), to the pervasive presence of specialists in complex organizations (Holmström 1984, Hart and Moore 2005), to the limited control of business unit managers (Dessein et al. 2006), and to the decentralized functional authority framework (Roberts 2004).¹⁰

The transformation possibility frontier includes implicitly both technological and strategic characteristics of a firm. The representation therefore captures the ability of a firm to change its risk characteristics through changes in its portfolio of projects. These changes may increase the value of the firm by decreasing its cash-flow beta (Stulz 2004) or by increasing it if doing so allows sufficiently higher expected cash flows. In the same spirit, the firm's reactivity with respect to the market price of risk is an important factor in the value of the CEO (or the use of financial derivative products in BBG context).

BBG show that firms whose cash flows are more reactive to changes in the market price of risk will be those where managerial conflicts will be costlier, and thus should be in the direst need for conflict resolution. In that sense, the simple theoretical and empirical findings they present support the idea that financial risk management alleviates coordination problems between different firm functions and divisions and reduces the cost of managerial conflicts. Alternatively, in the same context, the CEO become more powerful and valuable. BBG new rationale for corporate risk management theory, and the simple empirical test that they conduct, opens up a new area of research for further developing and testing the idea that the complexity of the modern firm may enhance the role of financial derivatives as well as the relative importance, hence compensation, of CEOs.

¹⁰ The trade-off between specialization benefits and coordination costs and the impact of such trade-off on organizational structure have been noted by many authors. See also Becker and Murphy (1993) and Boyer and Robert (2006).

IV. Conclusion

The CEO pay ratio, defined as the CEO pay (not the total compensation of a CEO since it typically excludes different forms of incentive bonuses) over the median salary of the firm's employees, is one of the most discussed topics in society today. I showed that the CEO pay ratio for the S&P500 firms (the largest US-traded firms by capitalization) reached an average value of 281 this last year (as of November 21 2019), a median value of 170 and a weighted average value of 185, the last two ratios being more representative of the overall distribution of the relative CEO pay. Other ratios, clearly more informative and revealing for stakeholders (employees, citizens, shareholders, suppliers and clients) are the CEO pay per employee (average of \$1961, median of \$564, weighted average of \$273) and the B-ratio, defined as the CEO pay over the total payroll of the firm, hence the implicit contribution of each employee (as a % of his/her salary) to the CEO pay (average of 2,30%, median of 0,88%, weighted average of 0,50%).

I discussed above the value of management (CEO) from a real options approach, which is arguably the proper methodology to use. Whether a given CEO is worth the pay she/he is getting remains an open question. But the difference between a good one and a bad one for employees and other stakeholders is potentially huge.

The CEO pay debate raise two additional crucially important and related questions. First, the question of inequalities in society, their determining factors, and their evolution over time. I discuss that question in my forthcoming paper "Inequalities: Income, Wealth, Consumption", where I show the level of inequality in income and wealth have been decreasing between 1920 and 1980 but increasing between 1980 and today, while inequality in consumption, arguably the most important form of inequality, has been decreasing over the whole period and in particular over the last two decades. I attempt in that paper to identify and explain the determinants of those movements. Second, the question of the social role of inequalities in income and wealth. I discuss that question in my forthcoming paper "The Social Role of Inequalities: Why Significant Inequality Levels in Income and Wealth Are Important for Our Prosperity and Collective Well Being", where I show that inequalities in income and wealth develop from two related social needs namely the need to ensure a proper level of savings and investments and the need to induce the proper but individually costly acquisition of new competencies, both to favor increased levels of productivity and prosperity.

V. References

- ABOWD, J., KAPLAN, D., “Executive Compensation: Six Questions that Need Answering,” *Journal of Economic Perspectives*, 13, 1999, 145-168.
- BECKER, G.S., MURPHY, K.M., “The Division of Labor, Coordination Costs, and Knowledge,” in *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, 3rd Edition, Univ. of Chicago Press, 1993.
- BOLTON, P., DEWATRIPONT, M., “The Firm as a Communication Network,” *Quarterly Journal of Economics* 109, 1994, 809–839.
- BOYER, M. (2019), « Erreurs méthodologiques dans l’évaluation des projets d’investissement », *Revue Française d’Économie* XXXIII (2018/4), avril 2019, 49-80. <https://www.cairn.info/revue-francaise-d-economie-2018-4-page-49.htm>
- BOYER, M. et alii (2017), *Advanced Methods of Investment Evaluation / Méthodes avancées d’évaluation d’investissement*, Monographie CIRANO Monograph, Hiver/Winter 2017, 601 pages, available at: <http://cirano.qc.ca/files/publications/2017MO-03.pdf>, <http://cirano.qc.ca/files/publications/2017MO-04.pdf>.
- BOYER, M., BOYER, M.M., GARCIA, R., “Alleviating Coordination Problems and Regulatory Constraints through Financial Risk Management”, *Quarterly Journal of Finance* 3(2), 2013, 39 pages.
- BOYER, M., CHRISTOFFERSEN, P., LASSERRE, P., PAVLOV, A., “Value Creation, Risk Management and Real Options”, *ICFAIAN Journal of Management Research* III (10), October 2004, 42-62. [“Création de valeur, gestion de risque et options réelles”, CIRANO 2003RB–01, 35 pages <https://cirano.qc.ca/files/publications/2003RB-01.pdf> / “Value Creation, Risk Management and Real Options” CIRANO 2003RB–02, 27 pages. <https://cirano.qc.ca/files/publications/2003RB-02.pdf>]
- BOYER, M., GRAVEL, É., “Évaluation options réelles du projet VEGA de Northern Canada Gas”, CIRANO 2012s-26, 63 pages. <https://cirano.qc.ca/files/publications/2012s-26.pdf>
- BOYER, M., ROBERT, J., “Organizational Inertia and Dynamic Incentives,” *Journal of Economic Behavior and Organization* 59(3), 2006, 324–348.
- CHRISTOFFERSEN, P., PAVLOV, A., “Company Flexibility, the Value of Management and Managerial Compensation,” CIRANO 2003s–06, 25 pages. <https://cirano.qc.ca/files/publications/2003s-06.pdf>
- DESSEIN, W., GARICANO, L., GERTNER, R., “Organizing for Synergies,” CEPR Discussion Paper No. 6019, 2006, Graduate School of Business, University of Chicago.
- GUAY, W., KOTHARI, S.P., “How Much do Firms Hedge with Derivatives?” *Journal of Financial Economics* 70, 2003, 423–461.

HART, O., MOORE, J., “On the Design of Hierarchies: Coordination versus Specialisation,” *Journal of Political Economy* 113, 2005, 675–702.

HOLMSTRÖM, B., 1984, On the Theory of Delegation, in M. Boyer, and R. E. Kihlstrom (editors), *Bayesian Models in Economic Theory*, North-Holland.

ROBERTS, D.J., *The Modern Firm*, Oxford University Press, 2006.

STULZ, R.M., 1996, “Rethinking Risk Management,” *Journal of Applied Corporate Finance* 9, 1996, 8–24.

STULZ, R.M., *Risk Management and Derivatives*, Thomson South-Western Publishers, 2004.

VI. DATA APPENDIX: S&P500 firms as of November 21, 2019 (notes 4, 5)

	A	B	C	D	E	F	G	H
	Company by sector	Median employee salary	CEO pay	Total nb. of employees	Total pay B*D	CEO pay ratio C/B	CEO pay per employee C/D	B-Ratio: CEO pay over Total Pay C/E
1								
2	Communications (note 1)							
3	Twitter Inc.	172 703 \$	1 \$	3 920	676 995 760 \$	0	0 \$	0,00%
4	Verizon Communications Inc.	120 645 \$	23 821 477 \$	144 500	17 433 202 500 \$	197	165 \$	0,14%
5	CenturyLink Inc.	68 674 \$	36 218 812 \$	45 000	3 090 330 000 \$	527	805 \$	1,17%
6	AT&T Inc.	95 814 \$	29 118 118 \$	268 220	25 699 231 080 \$	304	109 \$	0,11%
7	Viacom Inc.	25 469 \$	19 955 161 \$	10 400	264 877 600 \$	784	1 919 \$	7,53%
8	News Corp.	55 475 \$	12 977 958 \$	28 000	1 553 300 000 \$	234	463 \$	0,84%
9	The Walt Disney Co.	46 127 \$	65 662 806 \$	201 000	9 271 527 000 \$	1424	327 \$	0,71%
10	Discovery Inc.	85 704 \$	129 499 005 \$	9 000	771 336 000 \$	1511	14 389 \$	16,79%
11	CBS Corp.	104 007 \$	27 400 000 \$	12 770	1 328 169 390 \$	263	2 146 \$	2,06%
12	T-Mobile US Inc.	59 653 \$	66 500 000 \$	52 000	3 101 956 000 \$	1115	1 279 \$	2,14%
13	TOTAL (10 Firms)	834 271 \$	411 153 338 \$	774 810	63 190 925 330 \$	493	531 \$	0,65%
14	averages	83 427 \$	41 115 334 \$	77 481	6 319 092 533 \$			
15								
16	Consumer Discretionary							
17	Amazon.com Inc.	28 836 \$	1 700 000 \$	647 500	18 671 310 000 \$	59	3 \$	0,01%
18	NVR	63 456 \$	39 134 164 \$	5600	355 353 600 \$	617	6 988 \$	11,01%
19	Las Vegas Sands Corp.	40 611 \$	24 012 913 \$	51500	2 091 466 500 \$	591	466 \$	1,15%
20	DISH Network Corp.	54 048 \$	5 320 917 \$	16 000	864 768 000 \$	98	333 \$	0,62%
21	PulteGroup Inc.	95 551 \$	9 793 261 \$	5 086	485 972 386 \$	102	1 926 \$	2,02%
22	Garmin Ltd.	38 134 \$	2 900 000 \$	13 000	495 742 000 \$	76	223 \$	0,58%
23	Mohawk Industries Inc.	41 747 \$	4 631 485 \$	42 100	1 757 548 700 \$	111	110 \$	0,26%
24	Netflix Inc.	202 335 \$	36 100 000 \$	7 100	1 436 578 500 \$	178	5 085 \$	2,51%
25	LKQ Corp.	30 488 \$	3 978 116 \$	51 000	1 554 888 000 \$	130	78 \$	0,26%
26	O'Reilly Automotive Inc.	21 373 \$	4 866 262 \$	49 476	1 057 450 548 \$	228	98 \$	0,46%
27	Charter Communications Inc.	55 560 \$	8 156 151 \$	98 000	5 444 880 000 \$	147	83 \$	0,15%
28	Hasbro Inc.	66 893 \$	8 499 623 \$	5 800	387 979 400 \$	127	1 465 \$	2,19%
29	Nordstrom Inc.	34 454 \$	4 500 000 \$	71 000	2 446 234 000 \$	131	63 \$	0,18%
30	CarMax Inc.	38 554 \$	8 951 547 \$	25 946	1 000 322 084 \$	232	345 \$	0,89%
31	BorgWarner Inc.	45 547 \$	5 008 443 \$	30 000	1 366 410 000 \$	110	167 \$	0,37%
32	The Interpublic Group of Cos Inc.	73 494 \$	17 000 000 \$	54 000	3 968 676 000 \$	231	315 \$	0,43%
33	Ulta Beauty Inc.	25 666 \$	14 257 713 \$	16 000	410 656 000 \$	556	891 \$	3,47%
34	Tractor Supply Co.	26 731 \$	9 329 017 \$	15 000	400 965 000 \$	349	622 \$	2,33%
35	Ford Motor Co.	64 316 \$	17 752 835 \$	199 000	12 798 884 000 \$	276	89 \$	0,14%
36	General Motors Co.	77 849 \$	21 900 000 \$	173 000	13 467 877 000 \$	281	127 \$	0,16%
37	Advance Auto Parts Inc.	18 460 \$	8 900 000 \$	40 000	738 400 000 \$	482	223 \$	1,21%

	A	B	C	D	E	F	G	H
38	Whirlpool Corp.	20 485 \$	11 847 762 \$	92 000	1 884 620 000 \$	578	129 \$	0,63%
39	Under Armour Inc.	10 832 \$	6 556 629 \$	15 000	162 480 000 \$	605	437 \$	4,04%
40	Marriott International Inc.	34 594 \$	12 933 992 \$	176 000	6 088 544 000 \$	374	73 \$	0,21%
41	Target Corp.	22 439 \$	17 200 000 \$	360 000	8 078 040 000 \$	767	48 \$	0,21%
42	Leggett & Platt Inc.	32 182 \$	10 577 722 \$	22 000	708 004 000 \$	329	481 \$	1,49%
43	Expedia Group Inc.	67 457 \$	13 100 000 \$	24 500	1 652 696 500 \$	194	535 \$	0,79%
44	L Brands Inc.	14 186 \$	4 553 310 \$	25 500	361 743 000 \$	321	179 \$	1,26%
45	Comcast Corp.	82 205 \$	35 000 000 \$	184 000	15 125 720 000 \$	426	190 \$	0,23%
46	Lowe's Cos Inc.	22 921 \$	14 300 000 \$	300 000	6 876 300 000 \$	624	48 \$	0,21%
47	Newell Brands Inc.	34 688 \$	15 547 207 \$	37 000	1 283 456 000 \$	448	420 \$	1,21%
48	TripAdvisor Inc.	101 586 \$	2 000 000 \$	3 366	341 938 476 \$	20	594 \$	0,58%
49	Norwegian Cruise Line Holdings Ltd.	20 101 \$	22 600 000 \$	33 200	667 353 200 \$	1124	681 \$	3,39%
50	The Home Depot Inc.	23 389 \$	11 400 000 \$	413 000	9 659 657 000 \$	487	28 \$	0,12%
51	Hilton Worldwide Holdings Inc.	36 530 \$	19 803 897 \$	169 000	6 173 570 000 \$	542	117 \$	0,32%
52	Omnicom Group Inc.	42 206 \$	23 900 000 \$	70 400	2 971 291 840 \$	566	339 \$	0,80%
53	Booking Holdings Inc.	50 937 \$	20 500 000 \$	24 500	1 247 956 500 \$	402	837 \$	1,64%
54	Dollar General Corp.	13 773 \$	10 600 000 \$	135 000	1 859 355 000 \$	770	79 \$	0,57%
55	Best Buy Company Inc.	28 500 \$	17 382 486 \$	125 000	3 562 500 000 \$	610	139 \$	0,49%
56	Royal Caribbean Cruises Ltd.	19 396 \$	12 400 000 \$	7 000	135 772 000 \$	639	1 771 \$	9,13%
57	Wynn Resorts Ltd.	44 492 \$	17 227 260 \$	26 000	1 156 792 000 \$	387	663 \$	1,49%
58	Tiffany & Co.	33 642 \$	10 900 000 \$	14 200	477 716 400 \$	324	768 \$	2,28%
59	Macy's Inc.	21 885 \$	12 700 000 \$	130 000	2 845 050 000 \$	580	98 \$	0,45%
60	Chipotle Mexican Grill Inc.	13 779 \$	33 520 940 \$	67 900	935 594 100 \$	2433	494 \$	3,58%
61	PVH Corp.	18 089 \$	17 065 604 \$	20 500	370 824 500 \$	943	832 \$	4,60%
62	Kohl's Corp.	11 070 \$	12 340 445 \$	34 000	376 367 420 \$	1115	363 \$	3,28%
63	Ross Stores Inc.	10 027 \$	12 200 000 \$	88 100	883 378 700 \$	1217	138 \$	1,38%
64	VF Corp.	10 099 \$	17 842 521 \$	75 000	757 425 000 \$	1767	238 \$	2,36%
65	Yum! Brands Inc.	11 865 \$	14 007 038 \$	34 000	403 410 000 \$	1181	412 \$	3,47%
66	The TJX Cos Inc.	11 791 \$	18 800 000 \$	270 000	3 183 570 000 \$	1594	70 \$	0,59%
67	Hanesbrands Inc.	6 348 \$	8 832 708 \$	68 000	431 664 000 \$	1391	130 \$	2,05%
68	Harley-Davidson Inc.	74 359 \$	9 149 692 \$	5 900	438 718 100 \$	123	1 551 \$	2,09%
69	Alaska Air Group Inc.	54 584 \$	4 388 007 \$	21 641	1 181 252 344 \$	80	203 \$	0,37%
70	McDonald's Corp.	7 473 \$	15 876 116 \$	210 000	1 569 330 000 \$	2124	76 \$	1,01%
71	MGM Resorts International	36 192 \$	12 849 021 \$	55 000	1 990 560 000 \$	355	234 \$	0,65%
72	Fortune Brands Home & Security Inc.	49 020 \$	8 611 331 \$	25 300	1 240 206 000 \$	176	340 \$	0,69%
73	Aptiv Plc	5 414 \$	14 123 103 \$	143 000	774 202 000 \$	2609	99 \$	1,82%
74	Carnival Corp.	16 622 \$	13 515 884 \$	88 000	1 462 736 000 \$	813	154 \$	0,92%
75	Genuine Parts Co.	38 485 \$	5 300 329 \$	48 000	1 847 280 000 \$	138	110 \$	0,29%

	A	B	C	D	E	F	G	H
76	Lennar Corp.	88 244 \$	17 583 466 \$	11 626	1 025 924 744 \$	199	1 512 \$	1,71%
77	Starbucks Corp.	12 754 \$	13 382 480 \$	291 000	3 711 414 000 \$	1049	46 \$	0,36%
78	Copart Inc.	36 906 \$	203 005 \$	6 026	222 395 556 \$	6	34 \$	0,09%
79	AutoZone Inc.	23 546 \$	4 220 619 \$	90 000	2 119 140 000 \$	179	47 \$	0,20%
80	Tapestry Inc.	24 860 \$	12 825 430 \$	9 400	233 684 000 \$	516	1 364 \$	5,49%
81	Cintas Corp.	50 234 \$	9 778 369 \$	41 000	2 059 594 000 \$	195	238 \$	0,47%
82	Darden Restaurants Inc.	18 097 \$	15 770 151 \$	180 000	3 257 460 000 \$	871	88 \$	0,48%
83	H&R Block Inc.	16 319 \$	14 337 793 \$	3 100	50 588 900 \$	879	4 625 \$	28,34%
84	NIKE Inc.	24 955 \$	9 467 460 \$	73 100	1 824 210 500 \$	379	130 \$	0,52%
85	Ralph Lauren Corp.	22 787 \$	13 851 684 \$	13 000	296 231 000 \$	608	1 066 \$	4,68%
86	Capri Holdings Ltd.	25 700 \$	14 354 013 \$	11 096	285 167 200 \$	559	1 294 \$	5,03%
87	D.R. Horton Inc.	92 304 \$	14 886 528 \$	8 437	778 768 848 \$	161	1 764 \$	1,91%
88	Delta Air Lines Inc.	81 355 \$	15 000 000 \$	88 600	7 208 053 000 \$	184	169 \$	0,21%
89	eBay Inc.	119 562 \$	18 200 000 \$	14 000	1 673 868 000 \$	152	1 300 \$	1,09%
90	United Continental (Airlines) Holdings	72 924 \$	10 493 832 \$	92 000	6 709 008 000 \$	144	114 \$	0,16%
91	The Gap Inc.	5 831 \$	20 800 000 \$	135 000	787 185 000 \$	3567	154 \$	2,64%
92	TOTAL (75 firms)	3 014 123 \$	1 003 300 281 \$	6 324 500	194 612 128 546 \$	333	159 \$	0,52%
93	averages	40 188 \$	13 377 337 \$	84 327	2 594 828 381 \$			
94								
95	Consumer Staples							
96	The Kraft Heinz Co.	46 006 \$	4 194 179 \$	39 000	1 794 234 000 \$	91	108 \$	0,23%
97	Molson Coors Brewing Co.	73 135 \$	8 341 482 \$	17 750	1 298 146 250 \$	114	470 \$	0,64%
98	Kellogg Co.	46 948 \$	9 989 992 \$	34 000	1 596 232 000 \$	213	294 \$	0,63%
99	The Coca-Cola Co.	16 440 \$	16 701 328 \$	62 600	1 029 144 000 \$	1016	267 \$	1,62%
100	Monster Beverage Corp.	55 370 \$	13 900 000 \$	2 354	130 340 980 \$	251	5 905 \$	10,66%
101	Archer-Daniels-Midland Co.	51 087 \$	19 657 304 \$	31 600	1 614 349 200 \$	385	622 \$	1,22%
102	CVS Health Corp.	35 529 \$	21 953 040 \$	295 000	10 481 055 000 \$	618	74 \$	0,21%
103	Kimberly-Clark Corp.	36 637 \$	13 010 083 \$	41 000	1 502 117 000 \$	355	317 \$	0,87%
104	The Hershey Co.	29 270 \$	11 700 000 \$	14 930	437 001 100 \$	400	784 \$	2,68%
105	Mondelez International Inc.	30 639 \$	14 969 900 \$	80 000	2 451 120 000 \$	489	187 \$	0,61%
106	The Kroger Co.	24 912 \$	12 037 872 \$	453 000	11 285 136 000 \$	483	27 \$	0,11%
107	Colgate-Palmolive Co.	24 513 \$	11 551 328 \$	34 500	845 698 500 \$	471	335 \$	1,37%
108	PepsiCompany Inc.	44 974 \$	24 491 117 \$	267 000	12 008 058 000 \$	545	92 \$	0,20%
109	Philip Morris International Inc.	49 875 \$	15 934 235 \$	77 400	3 860 325 000 \$	319	206 \$	0,41%
110	Walmart Inc.	21 952 \$	23 618 233 \$	2 200 000	48 294 400 000 \$	1076	11 \$	0,05%

	A	B	C	D	E	F	G	H
111	Altria Group Inc.	123 012 \$	11 746 165 \$	8 300	1 020 999 600 \$	95	1 415 \$	1,15%
112	McCormick & Company Inc.	35 946 \$	14 836 426 \$	11 600	416 973 600 \$	413	1 279 \$	3,56%
113	Tyson Foods Inc.	37 069 \$	9 486 887 \$	121 000	4 485 349 000 \$	256	78 \$	0,21%
114	Hormel Foods Corp.	43 131 \$	6 353 255 \$	20 100	866 933 100 \$	147	316 \$	0,73%
115	Costco Wholesale Corp.	38 810 \$	7 408 513 \$	143 000	5 549 830 000 \$	191	52 \$	0,13%
116	Walgreens Boots Alliance Inc.	31 132 \$	13 542 260 \$	354 000	11 020 728 000 \$	435	38 \$	0,12%
117	Sysco Corp.	71 543 \$	9 098 603 \$	67 000	4 793 381 000 \$	127	136 \$	0,19%
118	Coty Inc.	43 507 \$	7 293 988 \$	20 000	870 140 000 \$	168	365 \$	0,84%
119	The Clorox Co.	61 372 \$	8 133 067 \$	8 700	533 936 400 \$	133	935 \$	1,52%
120	Campbell Soup Co.	64 546 \$	6 949 564 \$	23 000	1 484 558 000 \$	108	302 \$	0,47%
121	The Procter & Gamble Co.	60 412 \$	17 354 256 \$	92 000	5 557 904 000 \$	287	189 \$	0,31%
122	General Mills Inc.	54 828 \$	7 973 615 \$	40 000	2 193 120 000 \$	145	199 \$	0,36%
123	Conagra Brands Inc.	36 143 \$	10 473 271 \$	12 400	448 173 200 \$	290	845 \$	2,34%
124	Lamb Weston Holdings Inc.	59 508 \$	5 805 404 \$	7 200	428 457 600 \$	98	806 \$	1,35%
125	Brown-Forman Corp.	58 714 \$	3 695 893 \$	4 700	275 955 800 \$	63	786 \$	1,34%
126	Constellation Brands Inc.	53 851 \$	10 312 778 \$	9 800	527 739 800 \$	192	1 052 \$	1,95%
127	Dollar Tree Inc.	11 250 \$	9 398 842 \$	57 200	643 500 000 \$	835	164 \$	1,46%
128	Church & Dwight Company Inc.	64 001 \$	7 267 713 \$	4 700	300 804 700 \$	114	1 546 \$	2,42%
129	The Estee Lauder Cos Inc.	28 845 \$	48 753 819 \$	46 000	1 326 870 000 \$	1690	1 060 \$	3,67%
130	The JM Smucker Co.	71 045 \$	8 056 890 \$	7 400	525 733 000 \$	113	1 089 \$	1,53%
131	TOTAL (35 firms)	1 635 952 \$	445 991 302 \$	4 708 234	141 898 443 830 \$	273	95 \$	0,31%
132	averages	46 741 \$	12 742 609 \$	134 521	4 054 241 252 \$			
133								
134	Energy							
135	Kinder Morgan Inc.	106 850 \$	16 908 961 \$	11 012	1 176 632 200 \$	158	1 536 \$	1,44%
136	HollyFrontier Corp.	138 586 \$	11 350 368 \$	3 622	501 958 492 \$	82	3 134 \$	2,26%
137	The Williams Cos Inc.	122 742 \$	10 691 376 \$	5 322	653 232 924 \$	87	2 009 \$	1,64%
138	Noble Energy Inc.	124 842 \$	11 213 168 \$	2 330	290 881 860 \$	90	4 813 \$	3,85%
139	Pioneer Natural Resources Co.	123 103 \$	11 936 791 \$	3 177	391 098 231 \$	97	3 757 \$	3,05%
140	Apache Corp.	158 214 \$	15 200 000 \$	3 420	541 091 880 \$	96	4 444 \$	2,81%
141	Devon Energy Corp.	158 000 \$	12 500 000 \$	2 900	458 200 000 \$	79	4 310 \$	2,73%
142	Exxon Mobil Corp.	171 375 \$	18 800 000 \$	71 000	12 167 625 000 \$	110	265 \$	0,15%
143	Valero Energy Corp.	153 981 \$	18 759 156 \$	10 261	1 579 999 041 \$	122	1 828 \$	1,19%
144	ConocoPhillips	163 817 \$	23 423 434 \$	10 800	1 769 223 600 \$	143	2 169 \$	1,32%
145	Cabot Oil & Gas Corp.	82 714 \$	13 050 320 \$	303	25 062 342 \$	158	43 070 \$	52,07%
146	Chevron Corp.	142 362 \$	21 600 000 \$	48 600	6 918 793 200 \$	152	444 \$	0,31%
147	Baker Hughes a GE Co.	77 042 \$	15 959 761 \$	66 000	5 084 772 000 \$	207	242 \$	0,31%
148	Schlumberger Ltd.	75 134 \$	16 199 200 \$	100 000	7 513 400 000 \$	216	162 \$	0,22%

	A	B	C	D	E	F	G	H
149	National Oilwell Varco Inc.	51 917 \$	15 000 000 \$	35 063	1 820 365 771 \$	289	428 \$	0,82%
150	Halliburton Co.	88 244 \$	17 016 991 \$	60 000	5 294 640 000 \$	193	284 \$	0,32%
151	Marathon Petroleum Corp.	27 730 \$	19 806 050 \$	60 350	1 673 505 500 \$	714	328 \$	1,18%
152	ONEOK Inc.	130 481 \$	7 099 869 \$	2 684	350 211 004 \$	54	2 645 \$	2,03%
153	Concho Resources Inc.	156 097 \$	13 340 877 \$	1 503	234 613 791 \$	85	8 876 \$	5,69%
154	Phillips 66	196 407 \$	19 304 673 \$	14 200	2 788 979 400 \$	98	1 359 \$	0,69%
155	Occidental Petroleum Corp.	124 103 \$	14 126 873 \$	11 000	1 365 133 000 \$	114	1 284 \$	1,03%
156	Cimarex Energy Co.	118 035 \$	9 727 480 \$	955	112 723 425 \$	82	10 186 \$	8,63%
157	EOG Resources Inc.	161 964 \$	12 054 860 \$	2 800	453 499 200 \$	74	4 305 \$	2,66%
158	TechnipFMC Plc	59 634 \$	13 403 500 \$	37 000	2 206 458 000 \$	225	362 \$	0,61%
159	Helmerich & Payne Inc.	76 525 \$	7 777 164 \$	8 780	671 889 500 \$	102	886 \$	1,16%
160	Diamondback Energy Inc.	122 919 \$	10 500 000 \$	711	87 395 409 \$	85	14 768 \$	12,01%
161	Hess Corp.	178 908 \$	12 600 000 \$	1 708	305 574 864 \$	70	7 377 \$	4,12%
162	Marathon Oil Corp.	116 041 \$	12 200 000 \$	2 400	278 498 400 \$	105	5 083 \$	4,38%
163	TOTAL (28 firms)	3 407 767 \$	401 550 872 \$	577 901	56 715 458 034 \$	118	695 \$	0,71%
164	averages	121 706 \$	14 341 103 \$	20 639	2 025 552 073 \$			
165								
166	Financials (note 2)							
167	Berkshire Hathaway Inc.	58 691 \$	388 968 \$	389 373	22 852 690 743 \$	7	1 \$	0,00%
168	SVB Financial Group	135 614 \$	7 648 576 \$	2 900	393 280 600 \$	56	2 637 \$	1,94%
169	Cincinnati Financial Corp.	88 046 \$	3 444 610 \$	4 999	440 141 954 \$	39	689 \$	0,78%
170	E*TRADE Financial Corp.	102 732 \$	6 253 098 \$	4 000	410 928 000 \$	61	1 563 \$	1,52%
171	Loews Corp.	72 554 \$	5 714 569 \$	17 900	1 298 716 600 \$	79	319 \$	0,44%
172	Affiliated Managers Group Inc.	146 010 \$	7 500 000 \$	4 450	649 744 500 \$	51	1 685 \$	1,15%
173	CME Group Inc.	137 287 \$	13 416 665 \$	4 590	630 147 330 \$	98	2 923 \$	2,13%
174	Intercontinental Exchange Inc.	138 412 \$	14 513 403 \$	5 161	714 344 332 \$	105	2 812 \$	2,03%
175	KeyCorp.	62 853 \$	9 064 470 \$	17 664	1 110 235 392 \$	144	513 \$	0,82%
176	Nasdaq Inc.	111 155 \$	14 366 397 \$	4 099	455 624 345 \$	129	3 505 \$	3,15%
177	The Progressive Corp.	62 925 \$	14 172 925 \$	37 346	2 349 997 050 \$	225	380 \$	0,60%
178	Invesco Ltd.	119 367 \$	12 921 609 \$	7 459	890 358 453 \$	108	1 732 \$	1,45%
179	The Charles Schwab Corp.	104 281 \$	15 627 607 \$	19 500	2 033 479 500 \$	150	801 \$	0,77%
180	BB&T Corp.	68 778 \$	8 600 690 \$	35 852	2 465 828 856 \$	125	240 \$	0,35%
181	The Travelers Cos Inc.	95 238 \$	14 660 092 \$	30 400	2 895 235 200 \$	154	482 \$	0,51%
182	SunTrust Banks Inc.	67 311 \$	8 815 914 \$	22 899	1 541 354 589 \$	131	385 \$	0,57%
183	The Goldman Sachs Group Inc.	136 513 \$	20 662 835 \$	36 600	4 996 375 800 \$	151	565 \$	0,41%
184	Northern Trust Corp.	73 203 \$	7 971 986 \$	18 800	1 376 216 400 \$	109	424 \$	0,58%
185	Moody's Corp.	67 772 \$	10 556 511 \$	13 000	881 036 000 \$	156	812 \$	1,20%
186	Morgan Stanley	142 604 \$	28 168 639 \$	60 348	8 605 866 192 \$	198	467 \$	0,33%

	A	B	C	D	E	F	G	H
187	BlackRock Inc.	136 313 \$	26 500 000 \$	14 900	2 031 063 700 \$	194	1 779 \$	1,30%
188	MetLife Inc.	73 464 \$	17 400 000 \$	48 000	3 526 272 000 \$	237	363 \$	0,49%
189	US Bancorp	58 354 \$	13 437 128 \$	74 000	4 318 196 000 \$	230	182 \$	0,31%
190	Discover Financial Services	49 717 \$	10 168 771 \$	16 600	825 302 200 \$	205	613 \$	1,23%
191	Aon Plc	69 784 \$	16 181 591 \$	50 000	3 489 200 000 \$	232	324 \$	0,46%
192	Assurant Inc.	41 399 \$	13 616 946 \$	14 750	610 635 250 \$	329	923 \$	2,23%
193	Ameriprise Financial Inc.	94 570 \$	25 742 524 \$	14 000	1 323 980 000 \$	272	1 839 \$	1,94%
194	The Allstate Corp.	72 363 \$	18 700 000 \$	45 140	3 266 465 820 \$	258	414 \$	0,57%
195	State Street Corp.	68 527 \$	16 119 826 \$	40 000	2 741 080 000 \$	235	403 \$	0,59%
196	Bank of America Corp.	92 040 \$	22 765 354 \$	204 000	18 776 160 000 \$	247	112 \$	0,12%
197	Capital One Financial Corp.	67 165 \$	17 333 796 \$	47 600	3 197 054 000 \$	258	364 \$	0,54%
198	Prudential Financial Inc.	104 092 \$	26 634 837 \$	50 492	5 255 813 264 \$	256	528 \$	0,51%
199	Marsh & McLennan Cos Inc.	64 238 \$	17 281 919 \$	66 000	4 239 708 000 \$	269	262 \$	0,41%
200	Wells Fargo & Co.	65 191 \$	18 426 734 \$	259 000	16 884 469 000 \$	283	71 \$	0,11%
201	Synchrony Financial	41 933 \$	12 464 802 \$	16 500	691 894 500 \$	297	755 \$	1,80%
202	Chubb Ltd.	64 340 \$	20 357 484 \$	32 700	2 103 918 000 \$	316	623 \$	0,97%
203	American Express Co.	56 756 \$	17 353 942 \$	59 000	3 348 604 000 \$	306	294 \$	0,52%
204	The Bank of New York Mellon Corp.	61 380 \$	9 383 885 \$	51 300	3 148 794 000 \$	153	183 \$	0,30%
205	JPMorgan Chase & Co.	78 923 \$	30 040 153 \$	256 105	20 212 574 915 \$	381	117 \$	0,15%
206	Citigroup Inc.	49 766 \$	24 195 749 \$	204 000	10 152 264 000 \$	486	119 \$	0,24%
207	S&P Global Inc.	26 738 \$	12 360 845 \$	21 200	566 845 600 \$	462	583 \$	2,18%
208	American International Group Inc.	66 440 \$	20 854 669 \$	49 600	3 295 424 000 \$	314	420 \$	0,63%
209	Vornado Realty Trust	61 701 \$	11 599 270 \$	3 928	242 361 528 \$	188	2 953 \$	4,79%
210	Boston Properties Inc.	109 173 \$	11 694 946 \$	760	82 971 480 \$	107	15 388 \$	14,10%
211	SBA Communications Corp.	84 778 \$	9 101 986 \$	1 347	114 195 966 \$	107	6 757 \$	7,97%
212	Host Hotels & Resorts Inc.	183 956 \$	7 981 174 \$	184	33 847 904 \$	43	43 376 \$	23,58%
213	Weyerhaeuser Co.	70 427 \$	11 191 321 \$	9 300	654 971 100 \$	159	1 203 \$	1,71%
214	CBRE Group Inc.	65 849 \$	10 347 557 \$	90 000	5 926 410 000 \$	157	115 \$	0,17%
215	The Hartford Financial Services Group Inc.	104 925 \$	13 883 615 \$	18 500	1 941 112 500 \$	132	750 \$	0,72%
216	Cboe Global Markets Inc.	159 496 \$	8 453 137 \$	842	134 295 632 \$	53	10 039 \$	6,29%
217	Willis Towers Watson Plc	59 079 \$	4 991 828 \$	43 000	2 540 397 000 \$	84	116 \$	0,20%
218	People's United Financial Inc.	66 596 \$	5 700 284 \$	5 536	368 675 456 \$	86	1 030 \$	1,55%
219	Ventas Inc.	96 709 \$	13 116 300 \$	500	48 354 500 \$	136	26 233 \$	27,13%
220	Digital Realty Trust Inc.	132 150 \$	12 502 063 \$	1 148	151 708 200 \$	95	10 890 \$	8,24%
221	Crown Castle International Corp.	111 866 \$	9 025 526 \$	5 000	559 330 000 \$	81	1 805 \$	1,61%
222	Simon Property Group Inc.	66 910 \$	11 436 918 \$	5 000	334 550 000 \$	171	2 287 \$	3,42%
223	AvalonBay Communities Inc.	61 642 \$	10 079 434 \$	3 087	190 288 854 \$	164	3 265 \$	5,30%
224	Expeditors International of Washington Inc.	43 730 \$	6 915 480 \$	17 400	760 902 000 \$	158	397 \$	0,91%

	A	B	C	D	E	F	G	H
225	UDR Inc.	63 292 \$	6 278 476 \$	1 405	88 925 260 \$	99	4 469 \$	7,06%
226	Essex Property Trust Inc.	63 517 \$	5 434 232 \$	1 826	115 982 042 \$	86	2 976 \$	4,69%
227	Aflac Inc.	52 756 \$	17 535 398 \$	11 390	600 890 840 \$	332	1 540 \$	2,92%
228	Prologis Inc.	115 368 \$	28 201 400 \$	1 617	186 550 056 \$	244	17 441 \$	15,12%
229	Welltower Inc.	91 803 \$	12 884 453 \$	384	35 252 352 \$	140	33 553 \$	36,55%
230	Arthur J Gallagher & Co.	64 495 \$	8 062 954 \$	30 400	1 960 648 000 \$	125	265 \$	0,41%
231	Federal Realty Investment Trust	108 562 \$	7 464 182 \$	298	32 351 476 \$	69	25 048 \$	23,07%
232	Regency Centers Corp.	103 591 \$	5 419 621 \$	446	46 201 586 \$	52	12 152 \$	11,73%
233	Kimco Realty Corp.	98 568 \$	5 743 899 \$	533	52 536 744 \$	58	10 777 \$	10,93%
234	Torchmark Corp.	76 409 \$	7 837 660 \$	3 102	237 020 718 \$	103	2 527 \$	3,31%
235	Public Storage	24 909 \$	9 182 000 \$	5 600	139 490 400 \$	369	1 640 \$	6,58%
236	Realty Income Corp.	97 630 \$	8 054 588 \$	165	16 108 950 \$	83	48 816 \$	50,00%
237	First Republic Bank	13 910 \$	1 138 307 \$	4 480	62 316 800 \$	82	254 \$	1,83%
238	HCP Inc.	156 921 \$	8 619 819 \$	201	31 541 121 \$	55	42 885 \$	27,33%
239	Duke Realty Corp.	118 436 \$	6 873 613 \$	400	47 374 400 \$	58	17 184 \$	14,51%
240	The PNC Financial Services Group Inc.	67 648 \$	15 695 189 \$	50 928	3 445 177 344 \$	232	308 \$	0,46%
241	Comerica Inc.	81 479 \$	10 063 765 \$	7 865	640 832 335 \$	124	1 280 \$	1,57%
242	Citizens Financial Group Inc.	59 748 \$	9 405 933 \$	18 140	1 083 828 720 \$	157	519 \$	0,87%
243	Regions Financial Corp.	64 629 \$	9 919 304 \$	19 969	1 290 576 501 \$	153	497 \$	0,77%
244	Huntington Bancshares Inc.	58 188 \$	8 556 915 \$	15 693	913 144 284 \$	147	545 \$	0,94%
245	M&T Bank Corp.	62 061 \$	4 770 132 \$	17 267	1 071 607 287 \$	77	276 \$	0,45%
246	Apartment Investment & Management Co.	68 933 \$	6 773 403 \$	1 050	72 379 650 \$	98	6 451 \$	9,36%
247	Fifth Third Bancorp	64 186 \$	11 173 652 \$	17 437	1 119 211 282 \$	174	641 \$	1,00%
248	Raymond James Financial Inc.	92 950 \$	11 123 643 \$	13 900	1 292 005 000 \$	120	800 \$	0,86%
249	Franklin Resources Inc.	60 194 \$	9 450 152 \$	9 700	583 881 800 \$	157	974 \$	1,62%
250	Visa Inc.	132 483 \$	19 493 946 \$	17 000	2 252 211 000 \$	147	1 147 \$	0,87%
251	Jack Henry & Associates Inc.	68 516 \$	3 918 826 \$	6 307	432 130 412 \$	57	621 \$	0,91%
252	T Rowe Price Group Inc.	103 773 \$	13 086 753 \$	7 022	728 694 006 \$	126	1 864 \$	1,80%
253	American Tower Corp.	50 695 \$	14 300 000 \$	5 026	254 793 070 \$	282	2 845 \$	5,61%
254	Alexandria Real Estate Equities Inc.	140 000 \$	11 800 000 \$	386	54 040 000 \$	84	30 570 \$	21,84%
255	Equinix Inc.	97 035 \$	12 600 000 \$	7 903	766 867 605 \$	130	1 594 \$	1,64%
256	Equity Residential	57 841 \$	11 000 000 \$	2 700	156 170 700 \$	190	4 074 \$	7,04%
257	Extra Space Storage Inc.	35 614 \$	4 400 000 \$	3 624	129 065 136 \$	124	1 214 \$	3,41%
258	Iron Mountain Inc.	38 764 \$	11 300 000 \$	26 200	1 015 616 800 \$	292	431 \$	1,11%
259	Lincoln National Corp.	70 828 \$	14 400 000 \$	5 000	354 140 000 \$	203	2 880 \$	4,07%
260	Mid-America Apartment Communities Inc.	48 507 \$	4 700 000 \$	2 508	121 655 556 \$	97	1 874 \$	3,86%
261	The Macerich Co.	86 698 \$	12 900 000 \$	715	61 989 070 \$	149	18 042 \$	20,81%
262	Principal Financial Group Inc.	82 872 \$	12 200 000 \$	16 475	1 365 316 200 \$	147	741 \$	0,89%

	A	B	C	D	E	F	G	H
263	Everest Re Group Ltd.	140 639 \$	7 100 000 \$	1 415	199 004 185 \$	50	5 018 \$	3,57%
264	Unum Group	62 475 \$	9 900 000 \$	9 600	599 760 000 \$	158	1 031 \$	1,65%
265	Zions Bancorp NA	66 890 \$	4 400 000 \$	10 201	682 344 890 \$	66	431 \$	0,64%
266	SL Green Realty Corp.	68 880 \$	13 400 000 \$	1 058	72 875 040 \$	195	12 665 \$	18,39%
267	TOTAL (100 firms)	8 256 519 \$	1 206 373 573 \$	2 935 095	209 494 200 823 \$	146	411 \$	0,58%
268	averages	82 565 \$	12 063 736 \$	29 351	2 094 942 008 \$			
269								
270	Health Care							
271	Cerner Corp.	64 784 \$	9 800 000 \$	29 200	1 891 692 800 \$	151	336 \$	0,52%
272	Vertex Pharmaceuticals Inc.	232 178 \$	18 800 000 \$	2 500	580 445 000 \$	81	7 520 \$	3,24%
273	Illumina Inc.	107 884 \$	11 067 566 \$	7 300	787 553 200 \$	103	1 516 \$	1,41%
274	Zimmer Biomet Holdings Inc.	65 395 \$	9 710 434 \$	19 000	1 242 505 000 \$	148	511 \$	0,78%
275	Biogen Inc.	170 521 \$	16 200 000 \$	7 800	1 330 063 800 \$	95	2 077 \$	1,22%
276	Gilead Sciences Inc.	163 963 \$	25 961 831 \$	11 000	1 803 593 000 \$	158	2 360 \$	1,44%
277	Waters Corp.	78 872 \$	8 258 221 \$	7 246	571 506 512 \$	105	1 140 \$	1,44%
278	Eli Lilly & Co.	91 246 \$	17 230 337 \$	38 680	3 529 395 280 \$	189	445 \$	0,49%
279	IDEXX Laboratories Inc.	52 734 \$	6 819 950 \$	8 377	441 752 718 \$	129	814 \$	1,54%
280	Amgen Inc.	131 375 \$	18 600 000 \$	21 500	2 824 562 500 \$	142	865 \$	0,66%
281	WellCare Health Plans Inc.	81 647 \$	12 700 000 \$	12 000	979 764 000 \$	156	1 058 \$	1,30%
282	Zoetis Inc.	75 366 \$	11 669 400 \$	10 000	753 660 000 \$	155	1 167 \$	1,55%
283	DENTSPLY SIRONA Inc.	53 945 \$	11 300 000 \$	16 400	884 698 000 \$	209	689 \$	1,28%
284	Bristol-Myers Squibb Co.	112 174 \$	19 379 755 \$	23 300	2 613 654 200 \$	173	832 \$	0,74%
285	Mettler-Toledo International Inc.	42 416 \$	7 069 870 \$	16 000	678 656 000 \$	167	442 \$	1,04%
286	PerkinElmer Inc.	52 594 \$	13 961 376 \$	12 500	657 425 000 \$	265	1 117 \$	2,12%
287	Stryker Corp.	68 841 \$	13 911 065 \$	36 000	2 478 276 000 \$	202	386 \$	0,56%
288	Merck & Company Inc.	91 954 \$	20 900 000 \$	69 000	6 344 826 000 \$	227	303 \$	0,33%
289	Danaher Corp.	73 425 \$	15 361 041 \$	71 000	5 213 175 000 \$	209	216 \$	0,29%
290	Abbott Laboratories	80 569 \$	24 265 658 \$	103 000	8 298 607 000 \$	301	236 \$	0,29%
291	DaVita Inc.	60 889 \$	32 000 000 \$	77 700	4 731 075 300 \$	526	412 \$	0,68%
292	Anthem Inc.	72 308 \$	14 184 276 \$	63 900	4 620 481 200 \$	196	222 \$	0,31%
293	Cigna Corp.	63 526 \$	18 944 045 \$	73 800	4 688 218 800 \$	298	257 \$	0,40%
294	Laboratory Corp of America Holdings	43 230 \$	12 264 236 \$	61 000	2 637 030 000 \$	284	201 \$	0,47%
295	UnitedHealth Group Inc.	57 412 \$	18 100 000 \$	300 000	17 223 600 000 \$	315	60 \$	0,11%
296	HCA Healthcare Inc.	55 977 \$	21 419 906 \$	196 000	10 971 492 000 \$	383	109 \$	0,20%
297	Mylan NV	42 407 \$	13 346 299 \$	35 000	1 484 245 000 \$	315	381 \$	0,90%
298	Teleflex Inc.	43 225 \$	6 108 486 \$	15 200	657 020 000 \$	141	402 \$	0,93%

	A	B	C	D	E	F	G	H
299	Thermo Fisher Scientific Inc.	79 275 \$	18 600 000 \$	70 000	5 549 250 000 \$	235	266 \$	0,34%
300	Humana Inc.	70 498 \$	16 312 517 \$	41 600	2 932 716 800 \$	231	392 \$	0,56%
301	Allergan Plc	89 976 \$	6 624 473 \$	16 900	1 520 594 400 \$	74	392 \$	0,44%
302	Baxter International Inc.	45 226 \$	15 645 125 \$	50 000	2 261 300 000 \$	346	313 \$	0,69%
303	Centene Corp.	66 021 \$	26 132 414 \$	47 300	3 122 793 300 \$	396	552 \$	0,84%
304	IQVIA Holdings Inc.	90 097 \$	16 461 779 \$	58 000	5 225 626 000 \$	183	284 \$	0,32%
305	Johnson & Johnson	75 000 \$	20 111 045 \$	135 100	10 132 500 000 \$	268	149 \$	0,20%
306	Universal Health Services Inc.	40 826 \$	23 588 883 \$	78 700	3 213 006 200 \$	578	300 \$	0,73%
307	Align Technology Inc.	13 180 \$	41 758 338 \$	11 660	153 678 800 \$	3168	3 581 \$	27,17%
308	Quest Diagnostics Inc.	46 749 \$	9 966 964 \$	46 000	2 150 454 000 \$	213	217 \$	0,46%
309	Edwards Lifesciences Corp.	49 936 \$	10 278 949 \$	12 800	639 180 800 \$	206	803 \$	1,61%
310	Alexion Pharmaceuticals Inc.	223 882 \$	16 490 250 \$	2 656	594 630 592 \$	74	6 209 \$	2,77%
311	Incyte Corp.	228 006 \$	9 314 189 \$	1 367	311 684 202 \$	41	6 814 \$	2,99%
312	Pfizer Inc.	80 011 \$	19 549 213 \$	92 400	7 393 016 400 \$	244	212 \$	0,26%
313	Boston Scientific Corp.	62 447 \$	13 970 901 \$	32 000	1 998 304 000 \$	224	437 \$	0,70%
314	AbbVie Inc.	148 823 \$	21 271 869 \$	30 000	4 464 690 000 \$	143	709 \$	0,48%
315	Intuitive Surgical Inc.	163 552 \$	6 423 078 \$	5 527	903 951 904 \$	39	1 162 \$	0,71%
316	Perrigo Co Plc	70 888 \$	6 187 041 \$	10 600	751 412 800 \$	87	584 \$	0,82%
317	Agilent Technologies Inc.	68 579 \$	11 708 230 \$	14 800	1 014 969 200 \$	171	791 \$	1,15%
318	The Cooper Cos Inc.	37 289 \$	6 356 111 \$	12 000	447 468 000 \$	170	530 \$	1,42%
319	Hologic Inc.	87 845 \$	42 040 142 \$	6 252	549 206 940 \$	479	6 724 \$	7,65%
320	AmerisourceBergen Corp.	56 892 \$	11 533 906 \$	21 000	1 194 732 000 \$	203	549 \$	0,97%
321	Varian Medical Systems Inc.	144 511 \$	10 276 439 \$	7 000	1 011 577 000 \$	71	1 468 \$	1,02%
322	Becton Dickinson and Co.	44 118 \$	14 973 481 \$	76 032	3 354 379 776 \$	339	197 \$	0,45%
323	Johnson & Johnson	60 725 \$	9 082 204 \$	5 940	360 706 500 \$	150	1 529 \$	2,52%
324	Cardinal Health Inc.	51 434 \$	11 356 917 \$	50 200	2 581 986 800 \$	221	226 \$	0,44%
325	Medtronic Plc	73 693 \$	17 585 131 \$	86 000	6 337 598 000 \$	239	204 \$	0,28%
326	ABIOMED Inc.	115 794 \$	19 243 230 \$	1 371	158 753 574 \$	166	14 036 \$	12,12%
327	McKesson Corp.	38 026 \$	17 400 207 \$	80 000	3 042 080 000 \$	458	218 \$	0,57%
328	Henry Schein Inc.	74 931 \$	6 500 000 \$	18 000	1 348 758 000 \$	87	361 \$	0,48%
329	Regeneron Pharmaceuticals Inc.	134 115 \$	26 500 000 \$	7 400	992 451 000 \$	198	3 581 \$	2,67%
330	TOTAL (59 firms)	4 963 202 \$	932 576 778 \$	2 473 008	166 632 430 298 \$	188	377 \$	0,56%
331	averages	84 122 \$	15 806 386 \$	41 915	2 824 278 480 \$			
332								
333	Industrials							
334	CSX Corp.	105 169 \$	13 781 988 \$	22 500	2 366 302 500 \$	131	613 \$	0,58%
335	IDEX Corp.	63 175 \$	10 125 650 \$	7352	464 462 600 \$	160	1 377 \$	2,18%
336	Wabtec	39 210 \$	5 250 248 \$	18000	705 780 000 \$	134	292 \$	0,74%

	A	B	C	D	E	F	G	H
337	Rollins Inc.	111 960 \$	4 872 075 \$	13 734	1 537 658 640 \$	44	355 \$	0,32%
338	Fastenal Co.	39 229 \$	2 429 411 \$	21 619	848 091 751 \$	62	112 \$	0,29%
339	Equifax Inc.	68 733 \$	20 978 328 \$	10 900	749 189 700 \$	305	1 925 \$	2,80%
340	Southwest Airlines Co.	78 494 \$	7 726 455 \$	58 800	4 615 447 200 \$	98	131 \$	0,17%
341	Verisk Analytics Inc.	75 628 \$	7 744 757 \$	7 951	601 318 228 \$	102	974 \$	1,29%
342	WW Grainger Inc.	67 316 \$	10 465 572 \$	24 600	1 655 973 600 \$	155	425 \$	0,63%
343	Flowserve Corp.	81 830 \$	8 700 000 \$	17 000	1 391 110 000 \$	106	512 \$	0,63%
344	Kansas City Southern	48 187 \$	5 523 327 \$	7 200	346 946 400 \$	115	767 \$	1,59%
345	Waste Management Inc.	81 096 \$	9 125 281 \$	43 700	3 543 895 200 \$	113	209 \$	0,26%
346	Xylem Inc.	49 549 \$	8 327 670 \$	17 000	842 333 000 \$	168	490 \$	0,99%
347	General Electric Co.	58 204 \$	20 086 327 \$	283 000	16 471 732 000 \$	345	71 \$	0,12%
348	Textron Inc.	97 580 \$	13 968 652 \$	35 000	3 415 300 000 \$	143	399 \$	0,41%
349	Raytheon Co.	110 802 \$	22 400 000 \$	67 000	7 423 734 000 \$	202	334 \$	0,30%
350	Allegion Plc	45 460 \$	7 600 000 \$	11 000	500 060 000 \$	167	691 \$	1,52%
351	Northrop Grumman Corp.	105 191 \$	24 185 259 \$	85 000	8 941 235 000 \$	230	285 \$	0,27%
352	Republic Services Inc.	64 257 \$	11 787 571 \$	36 000	2 313 252 000 \$	183	327 \$	0,51%
353	American Airlines Group Inc.	61 527 \$	12 000 000 \$	128 900	7 930 830 300 \$	195	93 \$	0,15%
354	Snap-on Inc.	53 162 \$	8 896 358 \$	12 600	669 841 200 \$	167	706 \$	1,33%
355	Fortive Corp.	56 718 \$	13 720 993 \$	24 000	1 361 232 000 \$	242	572 \$	1,01%
356	General Dynamics Corp.	86 432 \$	20 720 254 \$	105 600	9 127 219 200 \$	240	196 \$	0,23%
357	United Technologies Corp.	71 799 \$	18 418 315 \$	240 000	17 231 760 000 \$	257	77 \$	0,11%
358	Dover Corp.	42 889 \$	28 354 477 \$	24 000	1 029 336 000 \$	661	1 181 \$	2,75%
359	Pentair Plc	58 564 \$	6 153 959 \$	10 000	585 640 000 \$	105	615 \$	1,05%
360	United Parcel Service Inc.	55 417 \$	15 072 127 \$	481 000	26 655 577 000 \$	272	31 \$	0,06%
361	Cummins Inc.	61 576 \$	17 291 978 \$	62 610	3 855 273 360 \$	281	276 \$	0,45%
362	Masco Corp.	38 769 \$	11 636 439 \$	26 000	1 007 994 000 \$	300	448 \$	1,15%
363	3M Co.	57 313 \$	17 320 459 \$	93 000	5 330 109 000 \$	302	186 \$	0,32%
364	Honeywell International Inc.	66 749 \$	19 246 604 \$	114 000	7 609 386 000 \$	288	169 \$	0,25%
365	Ingersoll-Rand Plc	61 418 \$	15 600 000 \$	49 000	3 009 482 000 \$	254	318 \$	0,52%
366	Roper Technologies Inc.	88 707 \$	29 054 430 \$	15 611	1 384 804 977 \$	328	1 861 \$	2,10%
367	Stanley Black & Decker Inc.	47 861 \$	13 580 324 \$	60 767	2 908 369 387 \$	284	223 \$	0,47%
368	Illinois Tool Works Inc.	49 632 \$	17 723 369 \$	48 000	2 382 336 000 \$	357	369 \$	0,74%
369	Nielsen Holdings Plc	29 055 \$	10 800 000 \$	46 000	1 336 530 000 \$	372	235 \$	0,81%
370	Robert Half International Inc.	23 905 \$	9 100 000 \$	18 900	451 804 500 \$	381	481 \$	2,01%
371	Union Pacific Corp.	79 902 \$	13 886 920 \$	41 967	3 353 247 234 \$	174	331 \$	0,41%
372	Norfolk Southern Corp.	98 477 \$	14 290 805 \$	26 662	2 625 593 774 \$	145	536 \$	0,54%
373	Arconic Inc.	50 232 \$	17 724 625 \$	43 000	2 159 976 000 \$	353	412 \$	0,82%
374	United Rentals	75 537 \$	13 598 202 \$	18 500	1 397 434 500 \$	180	735 \$	0,97%

	A	B	C	D	E	F	G	H
375	PACCAR Inc.	71 830 \$	13 007 482 \$	28 000	2 011 240 000 \$	181	465 \$	0,65%
376	Huntington Ingalls Industries Inc.	69 824 \$	5 551 979 \$	40 000	2 792 960 000 \$	80	139 \$	0,20%
377	Eaton Corp Plc	55 585 \$	14 691 178 \$	99 000	5 502 915 000 \$	264	148 \$	0,27%
378	Lockheed Martin Corp.	112 527 \$	21 516 613 \$	105 000	11 815 335 000 \$	191	205 \$	0,18%
379	The Boeing Co.	126 991 \$	23 392 187 \$	153 000	19 429 623 000 \$	184	153 \$	0,12%
380	Fluor Corp.	70 540 \$	12 673 601 \$	53 349	3 763 238 460 \$	180	238 \$	0,34%
381	AMETEK Inc.	81 314 \$	8 762 155 \$	18 200	1 479 914 800 \$	108	481 \$	0,59%
382	Keysight Technologies Inc.	115 035 \$	10 240 253 \$	12 900	1 483 951 500 \$	89	794 \$	0,69%
383	TransDigm Group Inc.	46 742 \$	23 471 608 \$	10 100	472 094 200 \$	502	2 324 \$	4,97%
384	Johnson Controls International plc	49 613 \$	15 393 868 \$	122 000	6 052 786 000 \$	310	126 \$	0,25%
385	Deere & Co.	76 083 \$	18 525 667 \$	74 000	5 630 142 000 \$	243	250 \$	0,33%
386	TE Connectivity Ltd.	20 758 \$	10 237 011 \$	80 000	1 660 640 000 \$	493	128 \$	0,62%
387	Emerson Electric Co.	36 791 \$	15 619 741 \$	87 500	3 219 212 500 \$	425	179 \$	0,49%
388	Rockwell Automation Inc.	56 192 \$	9 188 851 \$	23 000	1 292 416 000 \$	164	400 \$	0,71%
389	Jacobs Engineering Group Inc.	82 898 \$	13 051 363 \$	74 400	6 167 611 200 \$	157	175 \$	0,21%
390	Harris Corp.	97 422 \$	14 016 113 \$	17 500	1 704 885 000 \$	144	801 \$	0,82%
391	Parker-Hannifin Corp.	54 048 \$	18 238 446 \$	57 170	3 089 924 160 \$	337	319 \$	0,59%
392	A.O. Smith Corp.	19 317 \$	3 872 974 \$	16 300	314 864 003 \$	200	238 \$	1,23%
393	CH Robinson Worldwide Inc.	63 270 \$	8 558 856 \$	15 262	965 626 740 \$	135	561 \$	0,89%
394	JB Hunt Transport Services Inc.	62 150 \$	6 846 236 \$	27 621	1 716 645 150 \$	110	248 \$	0,40%
395	Caterpillar Inc.	73 464 \$	27 300 000 \$	104 000	7 640 256 000 \$	372	263 \$	0,36%
396	Quanta Services Inc.	87 144 \$	8 800 000 \$	39 200	3 416 044 800 \$	101	224 \$	0,26%
397	Wabtec Corp.	39 210 \$	5 300 000 \$	18 000	705 780 000 \$	135	294 \$	0,75%
398	FedEx Corp.	50 017 \$	16 700 000 \$	227 000	11 353 859 000 \$	334	74 \$	0,15%
399	TOTAL (65 firms)	4 325 476 \$	884 225 391 \$	3 979 975	265 819 562 764 \$	204	222 \$	0,33%
400	averages	66 546 \$	13 603 468 \$	61 230	4 089 531 735 \$			
401								
402	Materials							
403	CF Industries Holdings Inc.	107 901 \$	7 758 005 \$	2 900	312 912 900 \$	72	2 675 \$	2,48%
404	Vulcan Materials Co.	79 390 \$	7 702 907 \$	8 373	664 732 470 \$	97	920 \$	1,16%
405	International Flavors & Fragrances Inc.	60 167 \$	8 521 940 \$	13 000	782 171 000 \$	142	656 \$	1,09%
406	Martin Marietta Materials Inc.	71 335 \$	8 500 000 \$	8 714	621 613 190 \$	119	975 \$	1,37%
407	Nucor Corp.	106 097 \$	15 559 469 \$	26 300	2 790 351 100 \$	147	592 \$	0,56%
408	Packaging Corp of America	76 730 \$	10 265 570 \$	15 000	1 150 950 000 \$	134	684 \$	0,89%
409	LyondellBasell Industries NV	114 759 \$	18 206 796 \$	19 450	2 232 062 550 \$	159	936 \$	0,82%
410	Eastman Chemical Co.	89 284 \$	15 918 483 \$	14 500	1 294 618 000 \$	178	1 098 \$	1,23%
411	DuPont Inc.	75 018 \$	18 675 301 \$	98 000	7 351 764 000 \$	249	191 \$	0,25%
412	Sealed Air Corp.	53 068 \$	8 950 447 \$	15 500	822 554 000 \$	169	577 \$	1,09%
413	International Paper Co.	61 508 \$	21 911 137 \$	53 000	3 259 924 000 \$	356	413 \$	0,67%
414	Ecolab Inc.	54 285 \$	14 364 033 \$	49 000	2 659 965 000 \$	265	293 \$	0,54%

	A	B	C	D	E	F	G	H
415	FMC Corp.	53 840 \$	9 994 552 \$	7 300	393 032 000 \$	186	1 369 \$	2,54%
416	Freeport-McMoRan Inc.	75 158 \$	16 400 000 \$	26 800	2 014 234 400 \$	218	612 \$	0,81%
417	The Sherwin-Williams Co.	42 447 \$	13 213 749 \$	53 368	2 265 311 496 \$	311	248 \$	0,58%
418	PPG Industries Inc.	39 494 \$	11 784 404 \$	47 300	1 868 066 200 \$	298	249 \$	0,63%
419	Avery Dennison Corp.	12 523 \$	8 709 697 \$	30 000	375 690 000 \$	695	290 \$	2,32%
420	Albemarle Corp.	78 867 \$	6 581 558 \$	5 900	465 315 300 \$	83	1 116 \$	1,41%
421	Ball Corp.	73 843 \$	10 941 645 \$	17 500	1 292 252 500 \$	148	625 \$	0,85%
422	Celanese Corp.	81 180 \$	12 514 160 \$	7 684	623 787 120 \$	154	1 629 \$	2,01%
423	Air Products & Chemicals Inc.	50 802 \$	13 941 507 \$	16 300	828 072 600 \$	274	855 \$	1,68%
424	Linde Plc	40 601 \$	66 149 326 \$	80 820	3 281 372 820 \$	1629	818 \$	2,02%
425	The Mosaic Co.	41 594 \$	10 500 000 \$	12 900	536 562 600 \$	252	814 \$	1,96%
426	Newmont Goldcorp Corp.	122 229 \$	11 400 000 \$	12 400	1 515 639 600 \$	93	919 \$	0,75%
427	Bemis Company Inc.	45 084 \$	7 730 729 \$	15 694	707 548 296 \$	171	493 \$	1,09%
428	Westrock Co.	53 553 \$	18 000 000 \$	45 100	2 415 240 300 \$	336	399 \$	0,75%
429	TOTAL (26 firms)	1 760 757 \$	374 195 415 \$	702 803	42 525 743 442 \$	213	532 \$	0,88%
430	averages	67 721 \$	14 392 131 \$	27 031	1 635 605 517 \$			
431								
432	Technology (note 3)							
433	Alphabet Inc.	246 804 \$	- \$	98 771	24 377 077 884 \$	0	- \$	0,00%
434	ServiceNow	192 878 \$	16 682 644 \$	8154	1 572 727 212 \$	86	2 046 \$	1,06%
435	CDW	89 164 \$	9 061 299 \$	9019	804 170 116 \$	102	1 005 \$	1,13%
436	Leidos Holdings	95 000 \$	9 834 974 \$	32000	3 040 000 000 \$	104	307 \$	0,32%
437	Salesforce.com Inc.	151 955 \$	28 400 000 \$	35 995	5 469 620 225 \$	187	789 \$	0,52%
438	Fortinet Inc.	131 767 \$	6 800 000 \$	5 845	770 178 115 \$	52	1 163 \$	0,88%
439	Facebook Inc.	228 651 \$	22 600 000 \$	35 587	8 137 003 137 \$	99	635 \$	0,28%
440	Arista Networks Inc.	135 688 \$	7 600 000 \$	2 300	312 082 400 \$	56	3 304 \$	2,44%
441	VeriSign Inc.	189 290 \$	9 200 000 \$	900	170 361 000 \$	49	10 222 \$	5,40%
442	IPG Photonics Corp.	49 703 \$	1 653 996 \$	6 220	309 152 660 \$	33	266 \$	0,54%
443	Cadence Design Systems Inc.	112 583 \$	7 556 368 \$	7 500	844 372 500 \$	67	1 008 \$	0,89%
444	Akamai Technologies Inc.	110 359 \$	11 347 676 \$	7 519	829 789 321 \$	103	1 509 \$	1,37%
445	NVIDIA Corp.	155 035 \$	13 600 000 \$	9 486	1 470 662 010 \$	88	1 434 \$	0,92%
446	Autodesk Inc.	117 829 \$	9 021 758 \$	9 600	1 131 158 400 \$	77	940 \$	0,80%
447	Total System Services Inc.	65 850 \$	10 862 672 \$	12 820	844 197 000 \$	165	847 \$	1,29%
448	Advanced Micro Devices Inc.	80 931 \$	13 356 392 \$	10 100	817 403 100 \$	165	1 322 \$	1,63%
449	FLIR Systems Inc.	73 692 \$	7 957 546 \$	3 649	268 902 108 \$	108	2 181 \$	2,96%
450	Alliance Data Systems Corp.	62 680 \$	10 000 000 \$	20 000	1 253 600 000 \$	160	500 \$	0,80%
451	Fiserv Inc.	78 052 \$	12 400 000 \$	24 000	1 873 248 000 \$	159	517 \$	0,66%
452	Mastercard Inc.	121 897 \$	20 400 000 \$	14 800	1 804 075 600 \$	167	1 378 \$	1,13%
453	Global Payments Inc.	60 931 \$	16 818 560 \$	11 000	670 241 000 \$	276	1 529 \$	2,51%
454	Texas Instruments Inc.	83 905 \$	17 596 997 \$	29 888	2 507 752 640 \$	210	589 \$	0,70%

	A	B	C	D	E	F	G	H
455	PayPal Holdings Inc.	69 600 \$	37 800 000 \$	21 800	1 517 280 000 \$	543	1 734 \$	2,49%
456	The Western Union Co.	29 942 \$	9 173 300 \$	12 000	359 304 000 \$	306	764 \$	2,55%
457	Activision Blizzard Inc.	96 726 \$	30 800 000 \$	9 900	957 587 400 \$	318	3 111 \$	3,22%
458	International Business Machines Corp.	55 088 \$	17 552 218 \$	350 600	19 313 852 800 \$	319	50 \$	0,09%
459	Corning Inc.	52 095 \$	14 921 071 \$	51 500	2 682 892 500 \$	286	290 \$	0,56%
460	Cognizant Technology Solutions Corp.	34 183 \$	14 100 000 \$	281 600	9 625 932 800 \$	412	50 \$	0,15%
461	Fidelity National Information Services Inc.	46 929 \$	18 400 000 \$	47 000	2 205 663 000 \$	392	391 \$	0,83%
462	Amphenol Corp.	13 197 \$	10 100 000 \$	73 600	971 299 200 \$	765	137 \$	1,04%
463	FleetCor Technologies Inc.	33 330 \$	7 800 000 \$	7 580	252 641 400 \$	234	1 029 \$	3,09%
464	ANSYS Inc.	142 631 \$	10 164 184 \$	1 700	242 472 700 \$	71	5 979 \$	4,19%
465	Intel Corp.	106 900 \$	16 706 700 \$	107 400	11 481 060 000 \$	156	156 \$	0,15%
466	Juniper Networks Inc.	131 633 \$	9 984 326 \$	9 283	1 221 949 139 \$	76	1 076 \$	0,82%
467	Motorola Solutions Inc.	96 553 \$	20 348 558 \$	16 000	1 544 848 000 \$	211	1 272 \$	1,32%
468	MSCI Inc	55 857 \$	2 978 454 \$	3 112	173 826 984 \$	53	957 \$	1,71%
469	Adobe Inc.	142 192 \$	28 397 528 \$	21 357	3 036 794 544 \$	200	1 330 \$	0,94%
470	HP Inc.	79 719 \$	19 215 534 \$	55 000	4 384 545 000 \$	241	349 \$	0,44%
471	Broadcom Inc.	202 915 \$	5 042 937 \$	15 000	3 043 725 000 \$	25	336 \$	0,17%
472	Synopsys Inc.	92 995 \$	7 432 836 \$	13 245	1 231 718 775 \$	80	561 \$	0,60%
473	Hewlett Packard Enterprise Co.	65 652 \$	12 623 005 \$	60 000	3 939 120 000 \$	192	210 \$	0,32%
474	Skyworks Solutions Inc.	20 881 \$	9 342 113 \$	9 400	196 281 400 \$	447	994 \$	4,76%
475	Analog Devices Inc.	53 821 \$	11 007 691 \$	15 800	850 371 800 \$	205	697 \$	1,29%
476	F5 Networks Inc.	146 911 \$	6 857 047 \$	4 409	647 730 599 \$	47	1 555 \$	1,06%
477	QUALCOMM Inc.	85 592 \$	19 975 472 \$	35 400	3 029 956 800 \$	233	564 \$	0,66%
478	Applied Materials Inc.	113 999 \$	14 064 540 \$	21 000	2 393 979 000 \$	123	670 \$	0,59%
479	Apple Inc.	55 426 \$	15 682 219 \$	132 000	7 316 232 000 \$	283	119 \$	0,21%
480	Accenture Plc	40 206 \$	22 299 174 \$	459 000	18 454 554 000 \$	555	49 \$	0,12%
481	Micron Technology Inc.	56 540 \$	14 241 583 \$	36 000	2 035 440 000 \$	252	396 \$	0,70%
482	Intuit Inc.	147 184 \$	21 071 738 \$	8 200	1 206 908 800 \$	143	2 570 \$	1,75%
483	Symantec Corp.	102 869 \$	17 347 581 \$	11 900	1 224 141 100 \$	169	1 458 \$	1,42%
484	Cisco Systems Inc.	132 764 \$	21 284 339 \$	74 200	9 851 088 800 \$	160	287 \$	0,22%
485	Microsoft Corp.	172 512 \$	42 910 215 \$	144 000	24 841 728 000 \$	249	298 \$	0,17%
486	Western Digital Corp.	10 999 \$	19 738 381 \$	71 600	787 528 400 \$	1795	276 \$	2,51%
487	Maxim Integrated Products Inc.	22 052 \$	8 085 050 \$	7 149	157 649 748 \$	367	1 131 \$	5,13%
488	KLA-Tencor Corp.	99 972 \$	12 391 300 \$	5 990	598 832 280 \$	124	2 069 \$	2,07%
489	Oracle Corp.	89 887 \$	108 295 023 \$	136 000	12 224 632 000 \$	1205	796 \$	0,89%
490	Lam Research Corp.	95 770 \$	12 848 645 \$	10 900	1 043 893 000 \$	134	1 179 \$	1,23%
491	Broadridge Financial Solutions Inc.	65 624 \$	11 216 495 \$	10 000	656 240 000 \$	171	1 122 \$	1,71%
492	Automatic Data Processing Inc.	59 284 \$	12 489 040 \$	57 000	3 379 188 000 \$	211	219 \$	0,37%

	A	B	C	D	E	F	G	H
493	Seagate Technology Plc	8 493 \$	9 332 073 \$	43 000	365 199 000 \$	1099	217 \$	2,56%
494	Paychex Inc.	54 790 \$	6 736 164 \$	14 300	783 497 000 \$	123	471 \$	0,86%
495	Take-Two Interactive Software Inc.	56 557 \$	42 629 \$	2 448	138 451 536 \$	1	17 \$	0,03%
496	NetApp Inc.	157 467 \$	12 859 367 \$	10 500	1 653 403 500 \$	82	1 225 \$	0,78%
497	Microchip Technology Inc.	40 737 \$	7 893 460 \$	18 286	744 916 782 \$	194	432 \$	1,06%
498	Xerox Corp.	85 276 \$	9 505 048 \$	32 400	2 762 942 400 \$	111	293 \$	0,34%
499	DXC Technology Co.	41 602 \$	17 256 539 \$	130 000	5 408 260 000 \$	415	133 \$	0,32%
500	Qorvo Inc.	44 708 \$	7 984 739 \$	8 100	362 134 800 \$	179	986 \$	2,20%
501	Xilinx Inc.	148 150 \$	6 589 807 \$	4 433	656 748 950 \$	44	1 487 \$	1,00%
502	Electronic Arts Inc.	91 661 \$	18 320 071 \$	9 700	889 111 700 \$	200	1 889 \$	2,06%
503	Citrix Systems Inc.	170 433 \$	19 300 000 \$	8 200	1 397 550 600 \$	113	2 354 \$	1,38%
504	IHS Markit Ltd.	87 721 \$	11 200 000 \$	14 900	1 307 042 900 \$	128	752 \$	0,86%
505	Gartner Inc.	107 147 \$	11 500 000 \$	15 173	1 625 741 431 \$	107	758 \$	0,71%
506	MarketAxess Holding Inc.	145 811 \$	16 600 000 \$	454	66 198 194 \$	114	36 564 \$	25,08%
507	TOTAL (74 firms)	6 995 627 \$	1 112 559 076 \$	3 114 672	236 521 862 190 \$	159	357 \$	0,47%
508	averages	94 536 \$	15 034 582 \$	42 090	3 196 241 381 \$			
509								
510	Utilities							
511	CMS Energy Corp.	106 125 \$	8 091 185 \$	8 625	915 328 125 \$	76	938 \$	0,88%
512	NiSource Inc.	97 754 \$	5 778 515 \$	8 087	790 536 598 \$	59	715 \$	0,73%
513	Alliant Energy Corp.	98 700 \$	6 500 000 \$	3 885	383 449 500 \$	66	1 673 \$	1,70%
514	Ameren Corp.	119 718 \$	8 454 460 \$	8 838	1 058 067 684 \$	71	957 \$	0,80%
515	Public Service Enterprise Group Inc.	133 067 \$	10 419 291 \$	7 318	973 784 306 \$	78	1 424 \$	1,07%
516	CenterPoint Energy Inc.	97 572 \$	8 887 981 \$	14 000	1 366 008 000 \$	91	635 \$	0,65%
517	FirstEnergy Corp.	96 805 \$	11 123 128 \$	12 494	1 209 481 670 \$	115	890 \$	0,92%
518	Consolidated Edison Inc.	106 453 \$	9 800 000 \$	15 591	1 659 708 723 \$	92	629 \$	0,59%
519	American Electric Power Company Inc.	110 125 \$	12 202 028 \$	17 582	1 936 217 750 \$	111	694 \$	0,63%
520	Dominion Energy Inc.	103 761 \$	14 956 442 \$	21 300	2 210 109 300 \$	144	702 \$	0,68%
521	WEC Energy Group Inc.	107 894 \$	9 862 993 \$	8 000	863 152 000 \$	91	1 233 \$	1,14%
522	Xcel Energy Inc.	108 946 \$	12 147 768 \$	11 043	1 203 090 678 \$	112	1 100 \$	1,01%
523	Exelon Corp.	124 000 \$	15 600 000 \$	33 383	4 139 492 000 \$	126	467 \$	0,38%
524	PPL Corp.	81 211 \$	11 338 785 \$	12 444	1 010 589 684 \$	140	911 \$	1,12%
525	Sempra Energy	126 325 \$	9 918 077 \$	20 000	2 526 500 000 \$	79	496 \$	0,39%
526	NextEra Energy Inc.	125 365 \$	21 358 742 \$	14 200	1 780 183 000 \$	170	1 504 \$	1,20%
527	Duke Energy Corp.	117 132 \$	13 982 960 \$	30 083	3 523 681 956 \$	119	465 \$	0,40%
528	firstEnergy Corp.	67 771 \$	9 759 811 \$	8 754	593 267 334 \$	144	1 115 \$	1,65%

	A	B	C	D	E	F	G	H
529	Pinnacle West Capital Corp.	133 779 \$	12 145 522 \$	6259	837 322 761 \$	91	1 940 \$	1,45%
530	American Water Works Company Inc.	83 599 \$	4 983 114 \$	7 100	593 552 900 \$	60	702 \$	0,84%
531	Evergy Inc.	133 449 \$	6 826 844 \$	4 832	644 825 568 \$	51	1 413 \$	1,06%
532	The Southern Co.	113 035 \$	13 097 691 \$	30 286	3 423 378 010 \$	116	432 \$	0,38%
533	Eversource Energy	129 401 \$	14 925 381 \$	7 998	1 034 949 198 \$	115	1 866 \$	1,44%
534	Entergy Corp.	123 392 \$	10 326 456 \$	13 688	1 688 989 696 \$	84	754 \$	0,61%
535	Edison International	166 888 \$	9 824 871 \$	12 574	2 098 449 712 \$	59	781 \$	0,47%
536	DTE Energy Co.	120 861 \$	10 986 808 \$	10 600	1 281 126 600 \$	91	1 036 \$	0,86%
537	NRG Energy Inc.	115 122 \$	8 914 948 \$	4 862	559 723 164 \$	77	1 834 \$	1,59%
538	Atmos Energy Corp.	80 965 \$	11 000 000 \$	4 628	374 706 020 \$	136	2 377 \$	2,94%
539	TOTAL (28 firms)	3 129 215 \$	303 213 801 \$	358 454	40 679 671 937 \$	97	846 \$	0,75%
540	averages	111 758 \$	10 829 064 \$	12 802	1 452 845 426 \$			
541								
542								
543	GRAND TOTAL (500 firms)	38 322 909 \$	7 075 139 827 \$	25 949 452	1 418 090 427 194 \$			
544	Average over 500 firms	76 646 \$	14 150 280 \$	51 899	2 836 180 854 \$	281	1 961 \$	2,30%
545	Median over 500 firms	67 771 \$	12 400 000 \$	18 170	1 292 128 750 \$	170	564 \$	0,88%
546	Weighted average value or ratio / Ratio of average values (Note 6).					185	273 \$	0,50%
547								
548	Note 1: There are two clear CEO pay outliers in this sector: Twitter and Discovery.							
549	Note 2: There is a clear CEO pay outlier in this sector: Berkshire Hathaway.							
550	Note 3: There are two clear CEO pay outliers in this sector: Alphabet and Oracle.							
551	Note 4: The following firms recently added to the S&P500 index do not yet appear in the Bloomberg database: Fox Corp., Dow Inc., Corteva and Amcor.							
552	Dow replaced Brighthouse financial and Corteva replaced Fluor Corp. (line 380);							
553	They spun off in the Spring of 2019 from DowDupont, which became Dupont de Nemours (line 411).							
554	Bemis (line 427) merged in June 2019 with Amcor, which later became Amcor plc.							
555	Note 5: The S&P 500 index covers about 80 percent of the American equity market by capitalization. The index is weighted by market capitalization.							
556	Note 6: The weighted average ratio 185 (C542/B542) is the same as the ratio of average values (C543/B543). Similarly for values 273\$ and 0,50%.							