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Methodology for measuring CEO compensation and the ratio of CEO-to-worker compensation

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This working paper presents the methodology for computing the trends in chief executive officer compensation and the ratio of CEO compensation to that of a "typical" worker, known as the "CEO-to-worker compensation ratio."

Annual compensation of a typical worker

Unfortunately, it is not possible to measure the actual wages and benefits of any particular firm's U.S. workforce, let alone the wages and benefits of its worldwide workforce, in order to compute the ratio of CEO compensation to worker compensation in a particular firm. We therefore develop a measure of the annual compensation of typical domestic workers in the key industry of each firm in our sample. We derive this measure by identifying the average hourly earnings of production and nonsupervisory workers in an industry, and then converting that figure to a full-time, full-year wage plus benefits, which is the measure of annual compensation.

In order to calculate a worker annual compensation series, we use data from the Bureau of Economic Analysis (BEA) and the Bureau of Labor Statistics (BLS). Because no data exist for the compensation of an average worker in a firm, we had to create our own proxy. Compensation data were collected from the BEA's National Income and Product Account (NIPA) Tables 6.2C and 6.2D, "Compensation of Employees by Industry." These tables give total compensation of all workers by industry for 1992–2010 (all years for which we have ExecuComp data except 2011). Wage and salary data corresponding to these compensation data come from NIPA Tables 6.3C and 6.3D, "Wage and Salary Accruals

by Industry." These tables provide total wage and salary disbursements to all workers in each industry for 1992–2010. Using these two datasets, we are able to create an industry-specific compensation-to-wage ratio by dividing total compensation by total wage and salary accruals in each industry. Applying this ratio to a measure of the wages of typical workers provides an estimate of compensation.

Average worker hourly earnings data are from the BLS Current Employment Statistics program (CES). We use average hourly earnings of production and nonsupervisory employees for each industry at the 3-digit NAICS (North American Industrial Classification System) level. This series is based on the regular establishment survey used to generate the payroll establishment employment data that are released by BLS each month along with the unemployment rate. Production and nonsupervisory employees represent over 80 percent of payroll employment. The hourly wages of production and nonsupervisory employees in 2011 were $19.47, 21 percent higher than the median hourly wage. The wage series for production and nonsupervisory employees has grown faster in inflation-adjusted terms than the median hourly wage series since 1992, 15 percent versus 5 percent. Choosing this series, therefore, leads to an understatement of the ratio of CEO pay to that of a typical worker.

To find average hourly worker compensation, the compensation-to-wage ratios from the BEA are multiplied by each respective average hourly earnings figure. Because data from the BEA were only available through 2010, the 2010 compensation-to-wage ratio was applied to the 2011 average hourly earnings from the CES. This results in average hourly worker compensation by industry at the 3-digit NAICS level. For some industries, wage data from the CES were available, but compensation-to-wage ratios from the BEA were not. In these instances, the compensation-to-wage ratio for the larger 2-digit NAICS-level industry that encompasses the 3-digit-level industry with the missing value was used.

Note: Data from NIPA Table 6.2C and Table 6.3C (data for 1992–2000) were broken down by SIC (Standard Industrial Classification) divisions rather than NAICS divisions. The executive compensation data, which come from Compustat, identify a firm's industry based on NAICS. Therefore, it was necessary to convert the NIPA data from SIC industries to NAICS industries so that the compensation-to-wage ratios could be comparable to the CES wage data. There is no perfect and seamless conversion from SIC to NAICS, but the differences have a small impact on the final estimated average worker compensation.

Because the data used are average hourly earnings and the CEO compensation data are presented as annual numbers, the final industry-level typical worker compensation data are multiplied by 2,080. This converts hourly compensation of production/nonsupervisory workers to annual average worker compensation, which can now be directly compared with the annual CEO compensation figures used to calculate CEO-to-worker compensation ratios (explained later). Most workers do not work full-time and year-round, so the annual compensation measure we are employing clearly *overstates* the actual annual compensation of a typical worker.

Average CEO compensation

We use executive compensation data from the ExecuComp database from Compustat, a division of Standard & Poor's. The ExecuComp database contains data on many forms of compensation for the top five executives at publicly traded U.S. companies in the S&P 1500 Index for 1992–2010. In total, the database includes more than 3,000 companies and 33,000 executives. The information is provided by companies in accordance with SEC rules regarding reporting of executive compensation.

We have created two definitions of annual CEO compensation based on different ways of measuring option awards. The first definition of pay for an executive in a given year is the sum of salary, bonus, restricted stock grants, options exercised, and long-term incentive payouts (using variables SALARY, BONUS, RSTKGRNT, OPT_EXER_VAL, and LTIP—all from the ANNCOMP dataset). This definition of compensation (called "realized direct compensation") follows the definition used in previous versions of *The State of Working America,* which in turn adapted this definition from the *Wall Street Journal* annual report on CEO compensation (compensation reported by the *WSJ* has been compiled by various companies over the years, including Pearl Meyer, the Mercer Group, and the Hay Group). This is the longest CEO pay series available to us. The value of options exercised is also used by William Lazonick when calculating CEO compensation (Lazonick 2011).

The second definition of pay for an executive in a given year is the sum of salary, bonus, restricted stock grants, options granted (Compustat Black Scholes value), and long-term incentive payouts (using variables SALARY, BONUS, RSTKGRNT, OPTION_AWARDS_BLK_VALUE, and LTIP—all from the ANNCOMP dataset). This definition is also reported by the *WSJ* as "total direct compensation." The value of options granted is also used by Bebchuk and Grinstein (2005) as well as Frydman and Jenter (2010). Equilar's data series published in the *New York Times* (Singer 2012) uses the same method.

The two measures of CEO compensation are applied to the ExecuComp data for 1992 through 2005. Due to changes in SEC guidelines, the definitions of executive pay provided in proxy statements changed in 2006, making comparability to 2005 problematic. The biggest change in 2006 is that CEO pay included the value of all long-term incentives granted during 2006; the prior proxy definition of CEO pay, by contrast, included all unvested stock and option awards, including long-term incentives granted in previous years, not just in the current year.

We follow the methods of Frydman and Jenter in developing a continuous series. Specifically, to reconcile the 2006 change, the variable NONEQ_INCENT (non-equity incentive plan compensation) replaces the variable LTIP, and the variable STOCK_AWARDS_FV (grant-date fair value of stock awarded under plan-based awards) replaces RSTKGRNT in both definitions of CEO compensation for 2006–2010. Additionally, the variable OPTION_AWARDS_FV (grant-date fair value of options granted) replaces the variable OPTION_AWARDS_BLK_VALUE in the second definition over this same time period. Values for options exercised were not affected by the SEC changes.

Selection of CEOs

We define a CEO as an executive labeled a CEO by the variable CEOANN. Note that the executive flagged as the CEO may not necessarily be the highest-paid executive at the company.

The CEOs included in our series are CEOs at the top 350 firms based on sales (variable SALES) each year for 1992–2010. Note that there may not have been a named CEO at each of these firms for a particular year, so the sample size of CEOs varies slightly across years, from 321 to 348. Additionally, the group of companies changes year-to-year based on changes in sales and rankings by sales.

The industry breakdowns provided for each company in the ExecuComp database are at the 6-digit NAICS level (NAICS variable). These values were converted to 3-digit NAICS codes so that the CEO compensation data will be

TABLE 1

Comparison of CEO pay definitions

	Salary	Bonus	Stock option grants	Stock options exercised	Restricted stock grants	Long-term performance-based grants	Other compensation	Definition of companies
EPI options realized definition	X	X		X	X	X		CEOs at top 350 companies by sales
EPI options granted definition	X	X	X		X	X		CEOs at top 350 companies by sales
WSJ series realized direct compensation definition	X	X		X	X	X		CEOs at a varying number of companies
WSJ series total direct compensation	X	X	X		X	X		CEOs at a varying number of companies
Frydman and Jenter	X	X	X		X	X	X	CEOs at S&P 500 firms
Bebchuk and Grinstein	X	X	X		X	X	X	CEOs at S&P 500 firms
Lazonick	X	X		X	X	X	X	Top 100 executives
New York Times	X	X	X		X		X	Top 100 executives

Sources: Compustat, Wall Street Journal, Frydman and Jenter (2010), Bebchuk and Grinstein (2005), Lazonick (2011), New York Times (Singer 2012)

directly comparable to the average worker compensation data. Also, each company has a unique 6-digit identifying number, given by the variable GVKEY.

Comparison of CEO compensation measures

Table 1 shows what is included in our measures of CEO compensation as compared to measures that have been used in other research.

We have elected to closely follow the definitions (total direct compensation and realized direct compensation) of CEO pay used by the *WSJ* series. This is a high-profile metric that we have employed in previous work, and it provides some consistency to the *WSJ* CEO compensation measure available for years earlier than 1992. Therefore, we do not include "other compensation" as many other researchers have. Both of our CEO compensation series would be about 5.6 percent higher had we included "other compensation."

Table 2 shows sample comparisons of the various components of CEO pay between the EPI series and the *WSJ* series, specifically the CEO survey done for *WSJ* by the Hay Group in 2011. Options realized, and therefore realized direct compensation, are not listed on the *WSJ* website. The EPI series matches the *WSJ* series, as seen in the table.

Table 3 presents our CEO compensation series as compared with those of other researchers. Our two definitions mirror the same general trends seen in other series. All numbers are in millions of nominal dollars. The 1992 data shown in the two EPI CEO compensation measures are computed from the ExecuComp sample in 1992. Our final series adjusts these data to account for the smaller sample size in 1992 and 2011 than in other years (see the following section).

TABLE 2

Comparison of compensation components, WSJ vs. EPI, 2010

Company		Salary	Annual incentives (bonus + Itip)	Options granted	Options realized	Stock grants	Performance awards	Total direct compensation	Realized direct compensation
Aflac	WSJ	1378.40	4,048.40	6,814.20	N/A	0	3,418.20	15,659.20	N/A
	EPI	1378.40	4,048.36	6,814.24	10,234.72	0	3,418.16	15,659.15	19,079.63
PPL	WSJ	1179.00	2,594.90	1,153.90	N/A	1,814.70	869.50	7,612.00	N/A
	EPI	1178.97	2,594.90	1,153.93	0	1,814.70	869.50	7,612.03	6,458.10
Southwest Airlines	WSJ	465.00	930.00	0	N/A	1,842.00	0	3,237.00	N/A
	EPI	465.00	930.00	0	296.00	1,842.00	0	3,237.00	3,533.00
Verizon Communications	WSJ	2100.00	3,937.50	0	N/A	0	11,156.30	17,193.80	N/A
	EPI	2100.00	3,937.50	0	0	0	11,156.25	17,193.75	17,193.75
VF Corp	WSJ	1025.00	2,142.30	2,285.60	N/A	0	2,329.80	7,782.60	N/A
	EPI	1025.00	2,142.25	2,285.57	3,871.02	0	2,329.81	7,782.64	9,368.08

Note: All data are in thousands of 2010 dollars.

Source: Authors' analysis of Wall Street Journal/Hay Group and Compustat

As previously shown, the EPI data match the *WSJ* data for individual CEOs. The difference seen in aggregated average CEO compensation between the EPI options realized series and the *WSJ* realized direct compensation series can be explained by the selection of companies. The *WSJ* has changed the number of firms it includes in its calculation over the years, while we consistently use the top 350 firms ranked by sales (though the sample is less than 350 firms to the extent that firms do not list a CEO in that year). The EPI options realized series reports lower CEO compensation than does the *WSJ* series for 2010, $11.7 million versus $12.0 million, but it also starts at a lower level in 1992. The growth of CEO compensation in the EPI options realized series between 1992 and 2010 is 261 percent, while the *WSJ* series grows 243 percent. Brookman, Jandik, and Rennie (n.d.) conclude that the ExecuComp data and *WSJ* data align well and are closely associated.

In order to create a historical series from our dataset, we took the ratio of the EPI definitions of CEO pay to *WSJ* pay in 1992 and assumed that the ratio held true in previous years. Therefore, that ratio was applied to *WSJ* data back to 1965 to create two historical series (one based on options exercised and one based on options granted). In periods with gaps in the *WSJ* data, the ratios are linearly interpolated in intervening years.

The 1992 problem

The ExecuComp database from Compustat has a small sample in 1992 of just 228 firms. The change in CEO compensation from 1992 to 1993 computed from this database therefore incorporates the change in the sample as well as any underlying change in CEO compensation. We need data for 1992 in order to calculate CEO compensation data back to 1965 using *WSJ* series data (see below).

TABLE 3

Comparison of various CEO pay series

Year	EPI options realized definition	EPI options granted definition	Frydman/ Jenter	WSJ series realized direct compensation	Bebchuk/ Grinstein	Lazonick
1992	3.2	2.7	2.5	3.5		15.2
1993	3.4	3.0	2.7		3.0	14.3
1994	2.8	3.8	3.4		3.7	12.7
1995	3.8	4.2	3.8	3.0	4.1	14.7
1996	5.0	5.9	5.7		6.1	23.3
1997	7.7	7.9	7.1		8.1	32.6
1998	11.7	11.1	9.1		9.7	58.5
1999	10.5	11.1	9.7	8.4	11.8	53.4
2000	14.9	15.3	14.0	10.5	16.7	83.2
2001	8.5	13.2	12.3	8.6	14.1	51.2
2002	7.7	9.9	9.5	5.5	10.3	31.3
2003	10.0	9.8	8.9	7.2	9.3	41.3
2004	11.3	10.3	9.8	9.6		47.9
2005	13.7	10.9	10.1	11.0		60.3
2006	15.8	11.3	11.1	11.8		63.1
2007	16.5	11.5	10.7	12.3		57.4
2008	16.7	11.1	10.3	11.1		39.2
2009	9.6	9.2		8.9		29.6
2010	11.7	10.7		12.0		33.8

Note: All numbers are in millions of nominal dollars.

Sources: Compustat, Wall Street Journal, Frydman and Jenter (2010), Bebchuk and Grinstein (2005), and Lazonick (2011)

To correct the inconsistency of sample sizes, we first isolated the 96 firms that appeared in 1993 data but not in 1992 data and excluded them from our 1993 dataset. We then computed the CEO compensation growth rate from 1992 to 1993 for the remaining 228 firms that have data for both years. We set the 1992 level of CEO compensation to be the level consistent with growing compensation at the rate of the "constant sample of 228 firms" and with reaching the actual 1993 level of CEO compensation. This same method was used to calculate 2011 CEO pay for the 27 firms in the 2010 sample but missing from the 2011 sample.

CEO-to-worker pay ratio

To calculate the CEO-to-worker pay ratio for a firm we divide the compensation of the firm's CEO by the estimated annual compensation for the typical worker in that firm's key industry.

There are two possible approaches to obtaining the CEO-to-worker compensation ratio for the group of the 350 largest firms. The first is by computing the average CEO compensation and then dividing this by the average annual compensation of typical workers in those firms' key industries. This might be called the "ratio of the averages" method. The second approach is to average the ratios computed for each firm, which can be labeled the "average of the ratios" method. This method is only available if one has the firm-level data, as we do. The first method is the one we have previously employed because the only CEO data available were the averages produced in the *WSJ* series, to which we applied a measure of typical worker annual compensation in the private sector to obtain a ratio of CEO-to-worker pay. **Table 4** shows a comparison of annual worker compensation in the overall private sector and in the key industry of the top 350 firms each year.

The series we present is based on the "average of the ratios" of each firm, computed from the CEO-to-worker pay ratios available for the largest 350 firms. This is because these ratios accurately reflect the distance between the CEOs and workers in these large firms. In contrast, the "ratio of the averages" implicitly weights each firm by the compensation in that firm.

Let CEO_f = CEO pay in firm f

Let $\bar{W}_f$ = the average wage in firm f

Let m = number of firms

We are interested in getting the best summary measure of the ratio of CEO pay to the average wage,

$$\frac{CEO_f}{\bar{W}_f}.$$

The two main options are

$$\frac{\Sigma_f \frac{CEO_f}{\bar{W}_f}}{m}$$

(the average across firms of the ratio of CEO pay to the average wage) and

$$\frac{\frac{\Sigma_f CEO_f}{m}}{\frac{\Sigma_f \bar{W}_f}{m}}$$

(the ratio of the average across firms of CEO pay to the average across firms of the average wage).

TABLE 4

Comparison of worker compensation series

Year	Annual production worker compensation	Annual worker compensation at top 350 firms each year
1992	$27,783	$32,042
1993	$28,543	$33,161
1994	$29,234	$33,701
1995	$29,765	$33,960
1996	$30,540	$34,452
1997	$31,497	$35,125
1998	$32,657	$36,662
1999	$33,788	$38,176
2000	$35,115	$39,807
2001	$36,643	$40,802
2002	$38,182	$43,561
2003	$39,653	$46,213
2004	$40,412	$45,920
2005	$41,578	$46,188
2006	$42,968	$47,405
2007	$44,394	$48,067
2008	$46,271	$50,730
2009	$48,134	$52,773
2010	$49,280	$54,302
2011	$50,313	$55,424

Note: All data in nominal (not inflation-adjusted) dollars.

Source: Authors' analysis of Bureau of Economic Analysis National Income and Product Accounts and Bureau of Labor Statistics Current Employment Statistics

A simple analysis shows that the first option—the average of the ratios—is a more economically meaningful measure than the second option (the ratio of the averages). To see this, first note that the average of the ratios can be rewritten in the following way,

$$\frac{\Sigma_f \frac{CEO_f}{\bar{W}_f}}{m} = \Sigma_f \left[\frac{CEO_f}{\bar{W}_f} \bullet \frac{1}{m} \right],$$

and the ratio of the averages can be rewritten in the following way,

$$\frac{\frac{\Sigma_f CEO_f}{m}}{\frac{\Sigma_f \bar{W}_f}{m}} = \frac{\Sigma_f CEO_f}{\Sigma_f \bar{W}_f} = \Sigma_f \left[\frac{CEO_f}{\bar{W}_f} \bullet \frac{\bar{W}_f}{\Sigma_f \bar{W}_f} \right].$$

The difference between the two is thus the last term. This term can be interpreted as a weight. In the case of the average of the ratios, each firm in the calculation has an equal weight,

$$\frac{1}{m}.$$

In the case of the ratio of averages, each firm is weighted by its average wage,

$$\frac{\bar{W}_f}{\Sigma_f \bar{W}_f}.$$

In other words, in the case of the ratio of averages, firms with higher average wages have more weight than firms with lower average wages. There is no economic reason to use an average-wage-weighted mean of the ratio. We thus use the first option, the unweighted mean of the ratios.

However, we did do the analysis with both measures. We found that the ratio of averages is smaller than the average of ratios, which means that firms with lower average wages have a higher ratio of CEO pay to average worker pay than firms with higher average wages. The ratio of averages also *increases* more slowly over time, which means that firms with lower average wages have seen a larger *increase* in their ratio of CEO pay to average worker pay than have firms with higher average wages.

Extending the series back to 1965

We use the growth in CEO compensation in the *WSJ* series to extend the CEO compensation series and the CEO-to-worker compensation ratio series backward. The *WSJ* series conducted by Pearl Meyer covered the years 1965, 1968, 1973, 1978, 1989, and 1992. We convert the compensation series to constant dollars using the CPI-U-RS series and calculate the ratio of CEO compensation in each year as a fraction of the 1992 CEO compensation level. We then apply these ratios to the CEO compensation for 1992 calculated from the ExecuComp data. This moves the series backward in time so that the growth of CEO pay is the same as in the Pearl Meyers/*WSJ* series but is benchmarked to the levels in the ExecuComp series.

We make a similar set of computations to obtain a historical series for the CEO-to-worker compensation ratio. We start with the Pearl Meyer/*WSJ* series in constant dollars and divide it by an estimate of private-sector annual compensation of production/nonsupervisory workers in the same year. This series is drawn from the same sources used to develop the annual compensation of a "typical worker" reviewed above, except that the historical series relies on the private-sector average rather than the pay for particular firms: This corresponds to the aggregate nature of the CEO compensation series we employ. Using the CEO-to-worker compensation ratios (which are ratios of the averages) we establish the growth of the CEO-to-worker compensation ratio over the 1965–1992 period. We compute the fraction of the ratio each year to the 1992 value and then apply these fractions to the 1992 value of the CEO-to-worker compensation ratio calculated from the ExecuComp data to obtain a historical series. This historical series therefore reflects the growth of

the CEO-to-worker compensation ratio obtained from the Pearl Meyer/*WSJ* CEO compensation series and our estimate of private-sector annual compensation based on the BLS average hourly earnings for production/nonsupervisory workers series.

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