Does Disclosure affect CEO Pay Setting? Evidence from the Passage of the 1934 Securities and Exchange Act [*]

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November 2015

Abstract

Using newly digitized data from the Federal Trade Commission, I examine the evolution of executive compensation during the Great Depression, before and after mandated pay disclosure in 1934. I find that disclosure did not achieve the intended effect of broadly lowering CEO compensation. If anything, and in spite of popular outrage against compensation practices, average CEO compensation increased following disclosure relative to the upper fractiles of the non-CEO labor income distribution. Pay disclosure coincided with compression of the CEO earnings distribution. Following disclosure there was a pronounced drop in the residual variance of earnings—computed with size and industry controls—that accounts for over 80 percent of the drop in the overall variance. I document a lower pay-to-performance sensitivity and increases in the lower conditional quantiles of the earnings distribution relative to the non-CEO distribution. The evidence suggests an upward "ratcheting" effect whereby lower paid CEOs given the size and industry of their firm experienced gains while well paid CEOs conditional on these characteristics were not penalized. The unconditional maximum of CEO compensation did fall after disclosure, suggesting that disclosure may only have restrained only the most salient and visible wages.

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Mandated pay disclosure has received considerable attention as a low cost policy that can improve corporate governance and rein in soaring executive compensation. Pay transparency may compel boards to restrain compensation in response to political pressure and public antagonism towards top management pay packages. Disclosure may also improve accountability and correct situations where CEOs are paid more than what is warranted by the performance of their firm. But transparency may have unintended consequences and raise CEO pay for a number of reasons. CEOs could capture the pay process and use newly disclosed information to set favorable peer benchmarks, their performance could be negatively affected by horizontal pay comparisons, transparency could aggravate agency problems (Hermalin and Weisbach 2007), or firms could use CEO pay as a signal of a firm's performance (Hayes and Schaefer 2009).

In addition to its effects on pay levels, another interesting question is the effect of transparency on the dispersion of pay. A standard result in models of costly information acquisition is that when information is costly, agents are unable to arbitrage optimally resulting in excess price dispersion (e.g. Jensen 2007). In the labor context, as the more information on wages in the market become available, the dispersion of wage for workers with the same characteristics declines. In a world with perfect information and no frictions, the law of one price should hold so that workers with the same characteristics receive the same wage.

Previous studies have found evidence from the public sector that pay transparency can lead to shaming effects that compress top salaries (Mas 2015). In the private sector Faulkender and Yang (2012) find evidence that CEOs use favorable peer comparisons to

elevate pay. Card et al. (2012) provide experimental evidence that workers care about relative pay and Mas (2006) documents that being paid below a reference point affects performance. Gartenberg and Wulf (2014) provide evidence that horizontal wage considerations affect wage setting for managers. [1] Shue (2013) documents that there are peer effects within MBA cohorts in compensation levels.

While there are a number of studies that have sought to understand the implications of disclosure, no study has examined the effects on compensation following the 1934 Securities Exchange Act that established the legal and regulatory framework for mandated pay disclosure of listed companies. The lack of evidence from this period is unfortunate since this was arguably the most important shift in pay disclosure policy in the United States—subsequent regulatory changes were incremental—and the act represents a watershed moment in the history of corporate governance regulation.[2]

A challenge for analyzing the effects of the 1934 act is the lack of pre-disclosure compensation data, since compensation data is typically only available when it is disclosed. This paper takes advantage of unexploited (in the recent era) executive pay records to circumvent this challenge and analyze the act's effect on CEO compensation. In 1933, Congress requested that the Federal Trade Commission (FTC) collect schedules of salaries and bonuses of corporate officers for the years 1928-1932 for companies listed on the New York Stock Exchange or New York Curb Exchange with assets greater than one million dollars (Senate Resolution 75, 1933). Summaries of these data were the

[1] See also Shue and Townsend (2015); Vafeas and Afxentiou (1998); Craighead et al. (2004);
[2] A number of studies have sought to estimate the effects of other reporting requirements on measures of firm and security prices. In the Securities and Exchange Act. These include Stigler (1964), Benston (1973), Simon (1989), Mahoney and Mei (2006).

source of some of the earliest studies of CEO compensation (Baker 1939), but the data have not been analyzed in the modern era.[3] I digitized these FTC records for this study and linked them to digitized records from the Survey of American Listed Corporations (SALC) for years 1934-1940 as well as data from the Center for Research in Security Prices (CRSP). The result is a longitudinal record of compensation for the three highest paid executives and firm characteristics for more than 350 firms, spanning the Great Depression period and before and after mandated pay disclosure.[4] Through this data collection the paper contributes to documenting and understanding the historical evolution of executive pay, building on the work of Frydman (2014), Frydman and Malloy (2012), and Frydman and Saks (2010).

To partially account for other changes in the economy, and changes in legislation that affected high-income earners broadly, I compare CEO compensation to the 99.5 fractile of the labor income distribution (excluding capital gains) using the Piketty and Saez (2003) tax data. This fractile corresponds to high-income workers (in 1928 this was $122,629.3 in 2012 dollars), but is lower than the compensation of almost all (99 percent) of CEOs in the sample allowing me to make comparisons of high income earners while avoiding problems of contamination in the comparison group. I also control for the market capitalization of firms to account for the impact of economic shocks on firms from the Great Depression as well as other policies that affected firm size.

[3] I use the term CEO for the highest paid executive in a firm.
[4] Data from the Survey of American Listed Corporations were previously analyzed by Jensen and Murphy (1990).

I find little support for the intended outcome of the transparency policy, which was to reign in compensation. If anything, average CEO compensation rose over the 1932-1934 period in relation to the 99.5 fractile when disclosure requirements were enacted. This conclusion is only stronger when controlling for firm size. This finding is surprising given the toxic environment for CEOs over the period, and the harsh reactions from the press and politicians on learning true compensation levels (for example, Senator Burton Wheeler of Montana stated after the first release of compensation records that "for Captains of industry to be drawing down large salaries is unconscionable and unpatriotic." (quoted in Leff 1984))

The more striking finding, however, is pronounced compression in the earnings distribution, driven by a sharp reduction in the variance of residual compensation, the latter quantity derived by computing the residual of log compensation after controlling for firms' lagged log market capitalization and 2-digit SIC industry. Corresponding to this change, the R-squared in a regression of log CEO compensation on lagged log market capitalization and 2-digit industry increased by 10 percentage points over the same period, and the pay-to-performance sensitivity declined. These findings suggest that firms may have responded to a lower cost of information on peer earnings by shifting compensation towards observable benchmarks. Consistent with this conclusion, I document that firms with more negative residual compensation (again computed using firm size and industry) experienced larger compensation gains between 1932 and 1934 than in other years while I find no such relationship between unadjusted compensation levels and the subsequent change in compensation. In other words, firms did not cut pay

for highly compensated CEOs or increase pay for low paid CEOs, in general, rather they only adjusted compensation when the CEO was out of line with predicted compensation based on firm size and industry.

Was compression due to relatively low paid CEOs gaining or relatively highly paid CEOs losing ground? Estimating conditional quantile models I show that disclosure coincided with compensation gains in the lower percentiles of the compensation distribution, controlling for size and industry, whereas higher percentiles did not change significantly relative to the 99.5 fractile. The evidence is more consistent with a "ratcheting" effect whereby disclosure led firms that were paying their CEOs lower levels than would be predicted by size and industry to raise compensation. By contrast, more generous firms conditional on size and industry did not cut pay relative to the 99.5 benchmark following disclosure.

While one must be careful in attributing these changes in CEO compensation over the period to any single factor, as this was undoubtedly a turbulent period, the evidence is suggestive that disclosure led to these changes since disclosure was the primary policy over that period targeted at corporate executives, and other policies over the period, such as increasing marginal tax rates, do not easily account for this particular pattern of changes in the structure of compensation, particularly changes in the *residual* distribution. Overall, the findings provide little support for the role of disclosure of salaries in restraining CEO pay, and suggest that it may have had the opposite effect. The exception to this broader conclusion is maximum CEO compensation, which I document declined precipitously over the 1932-1934 period. If public attention was focused on the

extreme end of the distribution, disclosure may have shifted the right tail due to its visibility and salience.

Background

Prior to 1933, executive compensation was almost never disclosed and was considered sensitive information by companies. According to Wells (2010), "before the 1930s, the most important fact about executive compensation is that it was not public knowledge." As Murphy (2012) describes, "most [compensation] reports at the time were speculative, based on vague descriptions of company-wide bonus formulas that would allow estimates of aggregate but not individual bonuses" and there were few legal means to compel disclosure.

Momentum for executive pay disclosure built in the early 1930s as a result of anti-corporate sentiment propagated by the Depression and scandals that arose after exorbitant compensation packages at Bethlehem Steel and American Tobacco were leaked from lawsuits involving the companies. In the Bethlehem case, in 1930 it was revealed as a result of a lawsuit on a proposed merger that the president of the company had received $1,600,000 in compensation in 1929, a significantly high amount at the time ("Inquiry Into High Salaries Pressed By The Government," *New York Times,* October 29, 1933), while American Tobacco's CEO received almost $2,000,000 (Wells 2010; Girous 2015). According to Wells (2010), "the Bethlehem Steel and American Tobacco revelations, combined…with a Depression-generated disgust with corporate management, fueled public perceptions that executive compensation was both excessive and the product of self-dealing."

The outcry led to congressional hearings focused on compensation (the 1932-33 Pecora hearings) and with the first broad undertaking by the U.S. government to collect salaries and bonuses of corporate officers (Stock Exchange Practices 1933). On May 5, 1933 the Senate issued a resolution (Senate Resolution 75, 1933) requesting a report from the FTC showing the salary schedules of executive officers of corporations listed in the New York Stock Exchange and with more than a million dollars in assets ("2,000 Concerns Hit By Salary Inquiry," *New York Times*, October 19, 1933; "President Studies High Salary Curb," *New York Times,* October 20, 1933). The FTC collected schedules for 877 companies for years 1928-1932 and submitted their report to Congress and to the public on Feb 27, 1934. These records represented the first comprehensive disclosure of executive pay, and the release of this report dates the beginning of mandatory pay disclosure. Details of the records were described in the press as the report was submitted to Congress ("Pay and Bonuses of Business Heads Listed for Senate," *New York Times*, February 27, 1934)) and the disclosures fueled further disgust with executive pay levels. The data collected in the FTC report were also the source of several early academic studies on the topic, notably Baker (1939), and the basis for the analysis in this paper. Crucially, the report was retrospective and included pay records that pre-date disclosure.

The Securities and Exchanges Acts (SEA) of 1933 and 1934 provided the legal and regulatory foundation for compensation disclosure of executives of listed firms. The acts established the Securities and Exchange Commission (SEC), which required the disclosure of compensation for the three highest paid officers on the 10-K form

(Securities Exchange Act 1934). The combination of the SEA and the FTC survey meant that executive pay was in the public domain by February 1934.

There were a number of other legislative, executive and judicial actions aimed at restraining CEO pay over the period, but they are viewed as largely ineffective. There was particular distaste for high-salaried CEOs of companies receiving aid from the government via the Reconstruction Finance Corporation (RFC), a government corporation that provided financial support in the form of loans to certain at-risk businesses. Senator Hugo Black attempted to write into the terms of RFC aid that the RFC was banned from lending to companies whose CEOs were compensated in excess of $15,000, but it was rejected by Congress ("Senators Vote Salary Limit on R.F.C. Borrowers." *Chicago Daily Tribune*, May 5 1933). A number of similar attempts were made before the Pecora hearings, all unsuccessful. However, transportation coordinator Joseph Eastman was able to pressure railroad companies to limit executive compensation to $60,000 (this represented a significant drop for some executives, several of whom had salaries larger than $100,000 previously) (Lokey 1934).[5] RFC pay regulations were the high water mark for efforts to cap corporate pay directly. These cases were isolated, though, and the limits imposed on railroad salaries did not translate to other industries receiving RFC funds. No further meaningful legislative or executive actions were taken until World War II (Leff 1984).

5 While salary caps for all RFC-loan beneficiaries never went into practice, salaries for airmail carrier were capped at $17,500 in 1933 (Wells 2010). None of the data used in the analysis comes from railroad companies, so this unusual instance of a successful salary cap will not contaminate the results of the analysis.

While pay levels of corporate executives were used to justify higher tax rates, tax policy was targeted broadly to all high-income earners rather than being focused on executives. In 1931, the top marginal tax rate was 25% (on incomes greater than $100,000). In 1932, the marginal tax rate on income over $100,000 leapt up to 56%, while a new tax rate of 63% was instituted on incomes over $1,000,000. In 1936, this new top marginal tax rate was increased further to 79%, and eventually peaked at 94% in 1944. Corporations, but not executives, were specifically targeted in the Revenue Act of 1936, which introduced tax penalties for corporations retaining profits rather than distributing them as dividends (Revenue Act of 1936, 74th Cong. Sess. 2 CHS. 690, June 22 1936). There were legislative proposals to adding surtaxes on corporate compensation including proposed amendments to the 1932 and 1934 Revenue Acts, as well as 1935 legislation proposed by Senator Burton Wheeler, Senator Henry Ashurst, and Representative William McFarlane, but their proposals did not gain traction (Wells 2010).

There were also numerous legal challenges to corporate pay practices in the period, the most important one being the Supreme Court *Rogers v. Hill* (1933) ruling on compensation at American Tobacco. The ruling stated that even though the compensation plan had been approved by shareholders "if a bonus payment has no relation to the value of services for which it is given, it is in reality a gift in part, and the majority stockholders have no power to give away corporate property against the protest of the minority" (Rogers v. Hill 1933). The ruling was interpreted as threatening judicial oversight over executive compensation in cases where compensation could be considered "waste." The

Rogers v. Hill ruling was tested in several instances, for example in *Gallin v. National City Bank* (1935) in which the New York Supreme Court concluded that the contested pay package was not wasteful, but the ruling is seen as having almost no impact. One complication with the application of *Rogers v. Hill* was that it was very difficult to assess compensation in relation to services rendered, since compensation levels alone were not sufficient to establish waste. Wells (2010) writes that the

> cases concerning executive compensation at public corporations decided over the latter half of the 1930s slowly retreated from the expansive approach suggested in *Hill*. Courts still engaged in limited scrutiny of enormous compensation packages, but no court was willing to pursue *Hill* to its logical conclusion and hold that an executive compensation package, at least one not tainted by fraud or self-dealing, was wasteful.

To summarize, in spite of the desire by large segments of the public and politicians' efforts to restrain executive pay, executive, legislative and judicial efforts were largely rhetorical and symbolic.[6] While Congress and the courts were willing to identify excessive compensation in general as an issue, the lack of a reasonable measure to gauge executive pay levels resulted in little more than harsh denunciations. As Wells (2011) writes of these actions, "the most popular and effective response…turned on disclosure."[7]

Disclosure was seen as a less intrusive measure that would allow public scrutiny to curb CEO pay. The idea was that firms would respond to disclosure requirements by

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6 President Roosevelt had criticized executive pay in his 1933 presidential campaign but once in office he favored disclosure over pay ceilings. The Roosevelt Administration opposed the RFC pay limits of $17,500 in favor of a higher amount, and did not support wage controls until 1942. The exception to this stance was symbolic. The salaries in the motion picture industry were of particular concern to President Roosevelt, who "pressured the NRA to include in its motion picture industry code a fine of up to $10,000 for any movie studio offering" excessive pay. After a formal inquiry, the fine was never implemented. (Wells 2010)

7 Wells (2012) page 44.

voluntarily reducing executive pay to more reasonable level out of fear of shareholder and public backlash. Rather than requiring the government to intervene, mandated disclosure requirements were seen as a less disruptive way to address the issue of excessive compensation. The government and courts also felt they had a firmer legal standing to mandate disclosure compared to other, heavy-handed policy proposals, and the idea was preferred by President Roosevelt (Benston 1973).

As shown, the policies over this period, as well as the statements of politicians and regulators, were aimed to push compensation of corporate executives downward. At the time, records reveal that many corporations and executives opposed government inquiries of their salaries and legislation such as the Securities and Exchange Acts ("Industries Resent Salary Publicity," *New York Times*, October 18 1933; "Bankers Urge Changes in Securities Act," *The Wall Street Journal*, October 31 1933). These policies interacted with the broader economic forces, including declining market values, leading to what would seem to any casual observer to be a toxic environment for corporate executives.

Data

A contribution of this paper is the digitization of executive compensation data over the period 1928-1940, allowing a full account of executive pay trends over the Great Depression, both before and after mandated disclosure.

The compensation data for 1928-1932 come from the FTC report on compensation schedules. As discussed above, Congress requested that the FTC collect compensation schedules of "executive officers and directors of corporations engaged in

interstate commerce (other than public utilities corporations) having capital and assets of more than a million dollars, whose securities were listed on the New York Stock Exchange or the New York Curb Exchange." (Senate Resolution 75, 73rd Cong. 1st Sess. 1933). Importantly, the request was for total compensation, including "any compensation, fee, bonus, commission, or other payments, direct or indirect, in money or otherwise, for personal services." I located these records at the FTC library in Washington, DC and digitized them for this study.[8] There are 877 unique company records in the FTC data. While the records include salaries for 1933, bonuses are not included in the 1933 total so I exclude this year from the subsequent analyses.

Data for years 1934-1940 come from the Survey of American Listed Corporations (SALC) which was part of a Works Project Administration (WPA) project aimed at gathering detailed information on publicly traded companies, including executive compensation. Extracting information from firms' annual reports on S.E.C. form 10-K, the records contain data on total remuneration (including bonuses) separately for each of the three highest paid executives of firms for years 1934-1940 (Kaysen 1943). I obtained SALC records on 748 firms, 394 of which were listed on the New York Stock Exchange. Since financial corporations and public utilities generally report to other government agencies, the survey mostly covers manufacturing, mining, and chain distribution trades

8 A research assistant photographed every page of the records in the FTC archive. We then sent the photos to a data entry firm who entered them into spreadsheets. A second research assistant verified that the data were correctly entered by comparing random samples of the digitized records to the original source.

industries. The volumes were located in the Princeton University archives and then digitized for the study.[9]

While both the FTC and SALC records explicitly request that bonuses be included in renumeration totals, neither source is clear about whether stock options were included. The language of the requests suggests that they should have been included in the totals, but this alternative form of compensation was quite rare at the time in any case. Available evidence suggests that the majority of executive compensation was purely in the form of salaries until the 1920s, in contrast to the structure of compensation in Europe (Taussig and Barker 1925).[10] In the 1920s, bonus plans became popular, and a survey of industrial companies in 1928 found that 64% of these companies paid executives salaries and annual bonuses tied to firm performance (Wells 2010). Among the firms, bonuses ranged from less 1% of managerial compensation to over 96% (Wells 2010). Stock options, however, were much less popular and only became widely adopted after 1950, with less than 2.5% of firms' top-three executives reporting being offered stock options before 1940 (Frydman and Saks 2010). In addition, a study of bonus plans by Baker (1938) revealed that out of 59 large industrial firms surveyed only three offered manager stock options. In the Frydman and Saks (2010) sample, which includes value of options held, no compensation package included stock options in 1936-1937 and 1939, only one company reported options in 1938, and two in 1940.

[9] As with the FTC records, a research assistant photographed every page, and the photographs were then sent to a data entry firm. The data were then checked by a second research assistant.
[10] An exception is the bonus plan adopted by Bethlehem Steel, in 1902.

Using company names, I matched the companies in the FTC and the SALC data to companies in the CRSP database, and assigned them the CRSP permno id. I then linked the FTC and SALC data using the permno, and then merged the resulting dataset to the CRSP data from 1928-1940. In the main analysis I only include firms that appear in both the FTC and SALC records. The final working dataset consists of 369 firms with permnos that overlapped between the two sources.[11] There are 750 firms without the restriction that the firms appear in both samples and I will show some specifications for the full sample as well.

I use data from Piketty and Saez (2003) to examine the role of policies and economic forces that broadly impacted pay at the top of the distribution, including CEO pay. I use the 99.5 fractile of the wage income (excluding capital gains) distribution from as the comparison benchmark. The 99.5 fractile is close to the bottom of the CEO pay distribution (only 1.4 percent of CEOs were compensated below the 99.5 fractile in 1931), and so it has the advantage that changes in CEO pay should have a negligible effect on this measure.[12]

Summary statistics can be found on Table 1.

[11] While I limit the sample to firms that appear both in FTC and SALC data, not every firm appears in the sample in every year. Compensation data is missing in some years, and there is firm entry and exit. Exit and entry does not pose a major problem since changes over the middle of the sample (1932-1934) are of interest, when all firms are operating. The conclusions presented are robust to a variety of alternative samples and specifications, including choosing firms that have no missing values over spans of years (eg. 1929-1939), estimation with firm fixed-effects, using all firms without the restriction that they both be in the FTC and SALC samples, and linearly interpolating missing values.

[12] Piketty and Saez (2003) also report series for incomes of corporate officers. However, this series is not well suited for analyzing disclosure because the series corresponds to both private and publicly traded firms, the and the former was not affected by disclosure regulations. Additionally, there were likely changes over time in the number of firm employees who were classified as officers.

Results

CEO Compensation Growth

I begin by examining the evolution of CEO compensation levels, in 2012 dollars, in relation to the 99.5 fractile of the labor income distribution, and controlling for firm size. I then examine how the relationship between changes in CEO compensation an market capitalization changed over the period.

Figure 1 presents the growth of real CEO compensation between 1928 and 1940. To construct the figure, I regress log CEO compensation in 2012 dollars on dummies for years 1928-1931 and 1934-1941 (1932 is normalized to 0, and total compensation for 1933 is unavailable) with firm fixed-effects.[13] The figure shows that CEO compensation increased from 1928-1929, fell from 1929-1932, and exhibits an upward trend from 1934-1940. There is no evidence of a decline in CEO compensation around the time of disclosure. This conclusion holds when comparing CEO compensation to the 99.5 fractile in Figure 2. The figure reveals that CEO compensation was relatively more sensitive to the boom and bust period of 1928-1932 than the 99.5 fractile, and that CEO pay increased discretely by approximately 6 percent between 1932 and 1934 relative to the 99.5 fractile.

To examine how changes in firm size affected relative CEO compensation I estimate:

$$(1)\quad \ln(y_{it}/p_t^{99.5}) = \alpha_i + \sum_{k=1928}^{1931} \theta_k \, 1(k = t) + \sum_{k=1934}^{1940} \theta_k \, 1(k = t) + \beta \ln(mv_{it-1}) + \varepsilon_{it},$$

[13] See Table 2 for estimates without fixed-effects.

where y_{it} is CEO compensation in firm i and year t, $p_t^{99.5}$ is the 99.5th fractile in year t, α_i is a firm fixed-effect, and $\ln(mv_{it-1})$ is the log lagged market capitalization of the firm. Figure 4 plots the estimated θ_t coefficients, which are expressed relative to 1932. For reference, the estimated β coefficient is 0.215 (s.e. = 0.025) (Table 2). The figure shows that 1928-1932 fluctuation in $\ln(y_{it}/p_t^{99.5})$ is largely accounted for by changes in the size of firms, while increase in $\ln(y_{it}/p_t^{99.5})$ between 1932 and 1934 persists and grows in magnitude. Table 2 reports the point estimates and standard estimates underlying Figures 1-3 as well as alternative specifications. There is no evidence that average CEO pay levels declined and, if anything, when taking into account the time pattern of other high income earners and market values CEO compensation appears to have risen around this time.

Pay-to-Performance and Firm Size Relationships

I next turn to pay-to-performance sensitivities and the relationship between firm size and compensation. I follow Jensen and Murphy (1990), Murphy (1999) and Frydman and Saks (2010) and estimate the dollar change in CEO compensation per dollar change in a firm's market value. Overall 1928-1940 the estimated coefficient on the OLS regression of change in cash compensation on change in market capitalization (in $ thousands) including year dummies is 0.26 (s.e. = 0.12) (Column 1 of Table 3).[14] This relationship is larger than Jensen and Murphy's estimate over the 1934-1938 period of 0.175. However, column (2) shows that this relationship changed from before to after

[14] As in Jensen and Murphy (1990), I also included specifications with lagged change in market value but the lags were small and insignificant adding little to the pay-to-performance relationship.

disclosure. The coefficient is 0.34 over 1928-32 and only 0.061 over 1934-40. The difference is significant.

Columns (3) and (4) of Table 3 also show the relationship between log CEO compensation and log market capitalization in *t-1* in specifications that include year effects to absorb aggregate factors that affect both compensation and size. The relationship may reflect both pay-to-performance but also competitive forces in the CEO labor market that gives a premium to CEOs in larger firms (Tervio 2008). Interestingly, the estimated relationship between log CEO compensation and log market capitalization in *t-1* of 0.29 is almost identical to the modern-era estimates from Gabaix and Landier (2008) who estimate an elasticity of 0.30 using data from 1992-2004. I find that this relationship is somewhat smaller in the post-disclosure period than the pre-disclosure period, by about 3.1 percentage points, but this different is only marginally significant.

Dispersion

In this sub-section I examine the dispersion and residual dispersion of pay. If peer comparisons and benchmarking became increasingly important after disclosure due to a lower cost of information, we would expect to see compression in the earnings distribution. (Compression will have an ambiguous impact on mean earnings since it isn't clear whether firms or CEOs can better use this information to their advantage.) More precisely, we expect to see compression between firms with similar characteristics, such as industry and size, since these are likely the relevant peer groups for any pay comparison.

Compression in the overall earnings distribution can be seen in Figure 4 panel A, which plots the variance by year, and panel B, which plots the interquartile range.[15] The bars in Figure 4A show the p-value for the test that the null that the variance in each year is equal to the variance in 1934. Both figures show a drop in dispersion between 1932-1934 and we can reject equality of variances between each of the pre-disclosure years and the variance in 1934.

To compute the change in residual dispersion I first estimate:

$$\ln(y_{it}) = c + ind_i + \beta \ln(mv_{t-1}) + \varepsilon_{it}, \quad (2)$$

where ind_i is a dummy for the 2-digit industry of firm i. I fit this model separately for each year between 1928 and 1940 (except 1933) and compute residuals for all observations in that year. Figure 5 plots the variance of these residuals by year. The figure shows that the residual variance declined dramatically between 1932 and 1934, and the difference in the residual variance between 1932 and 1934 is significant at conventional levels. Appendix Figure 2 shows the figure over the full sample without imposing the restriction that firms appear in both samples. This larger sample has the disadvantage of changing composition of firms (which is less of a problem for comparisons of residual variance than the overall variance) but yields a more representative sample. The figure shows an almost identical pattern as in Figure 5.

[15] Appendix Figure 1 plots the 10th, 25th, 50th, 75th, and 90th percentiles of log real CEO pay by year. The figure shows some evidence on changes in dispersion between 1932-1934, particularly around the 25th-50th percentiles, which increase relative to the 75th and 90th percentiles.

Figure 6 plots the R-squared from the regression of log compensation on lagged market capitalization and industry by year. Not surprisingly, given the observed declines in the residual standard deviation, these variables become more predictive of compensation after 1932, with the R-squared increasing by approximately 10 percentage points between 1932 and 1934.

Columns (1) and (3) of Table 4 presents estimates of variances and residual variances by year, computed for the main working sample. Comparing columns (1) and (3) it can be seen that the fall in residual compensation between 1932-1934 is 77 percent as large as the overall variance reduction. If we constrain the sample to be balanced over the 1928-1938 period (5 years before and after disclosure), thus allowing for an exact decomposition of the change in the variance into changes in the residual versus between, the change in the residual variance accounts for 85 percent of the change in the overall variance (columns 6 and 9 of Table 4).

That the observed compression is largely due to changes within rather than between firm characteristics is consistent with peer comparison and benchmarking reducing pay dispersion. Another test of this mechanism is to ask whether firms that had negative residuals in 1932 experienced relatively larger compensation gains between 1932-1934 than firms with a larger residual. To analyze pay dynamics as a function of firms' positions in the residual pay distribution I estimate variants of the following model:

$$\Delta_2 \ln(y_{it}/p_t^{99.5}) = \upsilon 1(t = 1934) + \rho r_{i,t-2} + \delta \ln(y_{i,t-2}) \quad (3)$$

$$+\phi r_{i,t-2} * 1(t = 1934) + \tau \ln(y_{i,t-2}) * 1(t = 1934) + \gamma \Delta_2 \ln(mkt_t) + \varepsilon_{it}$$

for t = 1930, 1932, 1934, 1936, 1938, and 1940. Here $r_{i,t-2}$ is the firm's residual in period *t-2* computed separately for each year, and the Δ_2 denotes two year changes. The coefficient ρ captures the typical relationship between the initial residual in *t* and the change in log compensation between *t-2* and *t* while the ϕ coefficient captures the differential effect of this relationship between 1932 and 1934. The model is set up as a "horse race" between the effect of lagged residuals and lagged salary levels. The differential effect of lagged salary levels of the change in compensation between 1932 and 1934 is given by τ.

Column (1) of Table 5 presents these estimates. Consistent with the changes in the residual variance, we see that the growth rate in CEO compensation between 1932 and 1934 is larger for firms with a smaller (more negative) residual. The estimated ϕ term is -0.19 (s.e. = 0.09). By contrast, there is not significant relationship between unadjusted lagged log compensation levels and the change in compensation. The estimated τ coefficient is 0.040 (s.e. = 0.057). Column (2) presents a second model where I use three rather than two year lags (and accordingly, limit the sample to t=1931, 1934, 1937, and 1940) to verify that the results in column (1) are not driven by unusual behavior in 1932. The estimated ϕ and τ are stable with this change.

I explore the changes in the residual distribution in greater detail by estimating conditional quantile models. I estimate for every quantile ν (in increments of 5):

$$(4) \qquad Q_\nu\left(\ln\left(y_{it}/p_t^{99.5}\right)|ind_i, \ln(mv_{t-1})\right) = \sum_{k=1928}^{1931} \theta_{\nu k}\, 1(k=t) + \sum_{k=1934}^{1940} \theta_{\nu k}\, 1(k=t) + ind_i + \beta \ln(mv_{t-1})$$

Each estimate of $\theta_{\nu k}$ gives the νth percentile "effect" of compensation in year k relative to 1932 conditional on industry and size.

Figure 7 summarizes these estimates. Each panel corresponds to a year (1928-1940, excluding 1932-33) and plots the estimated θ values for that year by percentile. A noteworthy feature of the estimates is the tilting pattern by percentile observed from 1934-1940. This pattern implies that over this period the lower percentiles of the CEO compensation distribution increased relative to the higher percentiles conditional on firm size and industry. It is also the case that in 1934 the estimates for the lower percentiles are positive and significant, while higher percentiles are insignificant and close to 0. This suggests that behind the fall in residual dispersion are gains by lower percentile firms rather than compensation declines of higher percentile firms. Figure 8 summarizes the tilting pattern observed in Figure 7. For every year I regress the estimated θ against the percentile, weighting by the inverse of the squared standard error of θ. These slope estimates are plotted by year and it can be seen that tilting pattern shift after 1933 is significant.

The evidence considered points towards lower percentiles increasing relative to the 99.5th fractile while higher percentiles of the CEO distribution remaining relatively stable, both controlling for characteristics (Figure 7) and without controls (Appendix Figure 1). An exception to this pattern can be found at the extreme end of the CEO distribution. Figure 9 plots maximum log CEO compensation in 2012 prices by year for the sample of firms present in both the FTC and SALC datasets. Maximum compensation declines between 1928-1932,

but then declines dramatically—by approximately 50 percent—between 1932 and 1934. In the figure I also plot a second series that adjusts maximum compensation for firm size. I net out 0.29 (from Table 4 column 1) times log market capitalization from the maximum compensation and express the resulting series relative to the 1932 value. This adjustment shows a similar pattern as the unadjusted version, and shows that the fluctuations prior to 1933 in the maximum can be explained by changes in firm size while the reduction between 1932 and 1934 is not.

Discussion and Conclusion

Between 1932 and 1934 CEO compensation compressed, and firm size and industry became substantially more predictive of CEO compensation. One must be careful in how to interpret these changes as they took place during the height of the Great Depression, following Roosevelt's election, the implementation of the New Deal as well as other regulations of the Securities and Exchange Act. However, mandated pay disclosure is a prime candidate for understanding these changes since it was the primary policy aimed specifically at executive compensation. Other events do not easily explain the observed patterns. Importantly, the finding that compression primarily worked through changes in *residual* compensation helps distinguish the disclosure explanation from alternatives. For example, rising tax rates may have differentially affected higher and lower paid CEOs, but it is unclear why it should have differentially affected higher and lower paid CEOs within industry and size categories.

The evidence presented suggests that the introduction of mandated disclosure was associated with increases in the lower portions of the residual distribution, while keeping upper parts of the distribution unchanged. This evidence is consistent with increasing

importance of peer comparisons. That pay rose for lower residual firms suggests that disclosure revealed this fact, and in turn these lower paid CEOs were able to raise their compensation toward their higher paid peers. The change in the pay-to-performance sensitivity is also consistent with the disclosure explanation and the role of benchmarking since with more information on CEO pay, the market for CEOs becomes more relevant. As a result the optimal contract may put relatively more weight on aggregate market or peer group performance than individual firm performance.

This perverse response to disclosure is interesting to consider in contrast to Mas (2015) that finds that an unintended consequence of public sector disclosure was to reduce pay in a situation where pay was already compressed. The common thread linking both studies is the effect on maximum compensation. I find that maximum CEO compensation declined markedly over the period, even if other CEOs weren't negatively unaffected. Consistent with the public sector case, the finding suggests that if the policy succeeded in reigning in pay anywhere it is for the most visible and salient compensation packages. In fact, the historical record suggests that the outcry over executive compensation was aimed at extreme salaries, as the expression "no man can be worth $1,000,000 a year" was a popular aphorism at the time (Markham 2015). While a small number of CEOs did make more than one million dollars a year in the late 1920's and early 1930's, after disclosure this was no longer the case.

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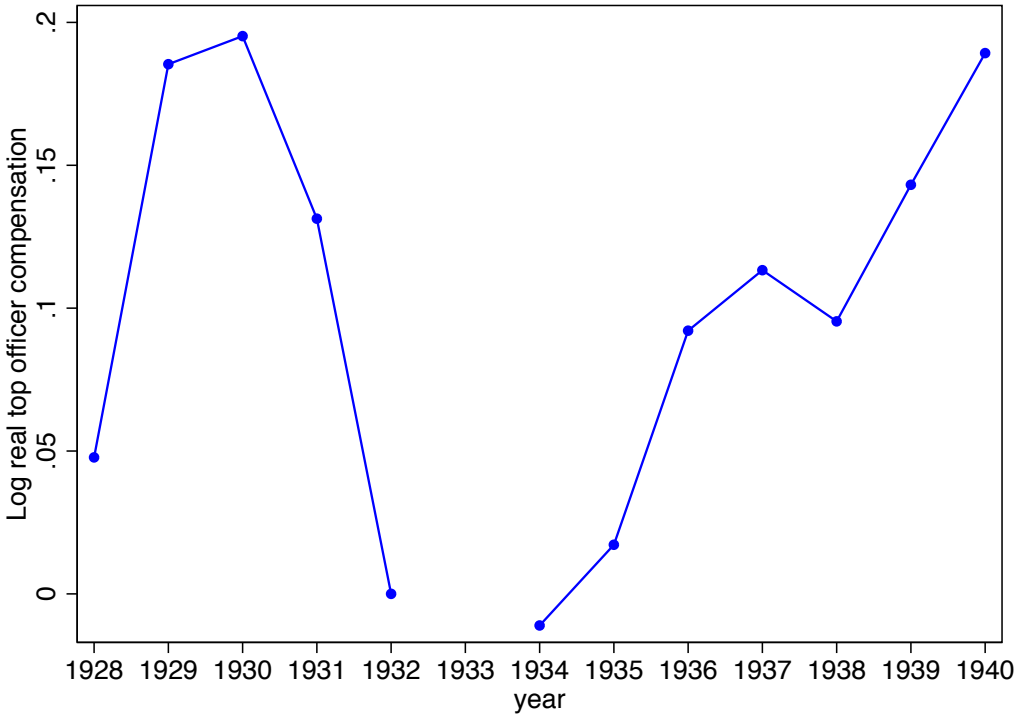
Figure 1. Evolution of CEO compensation, 1928-1940

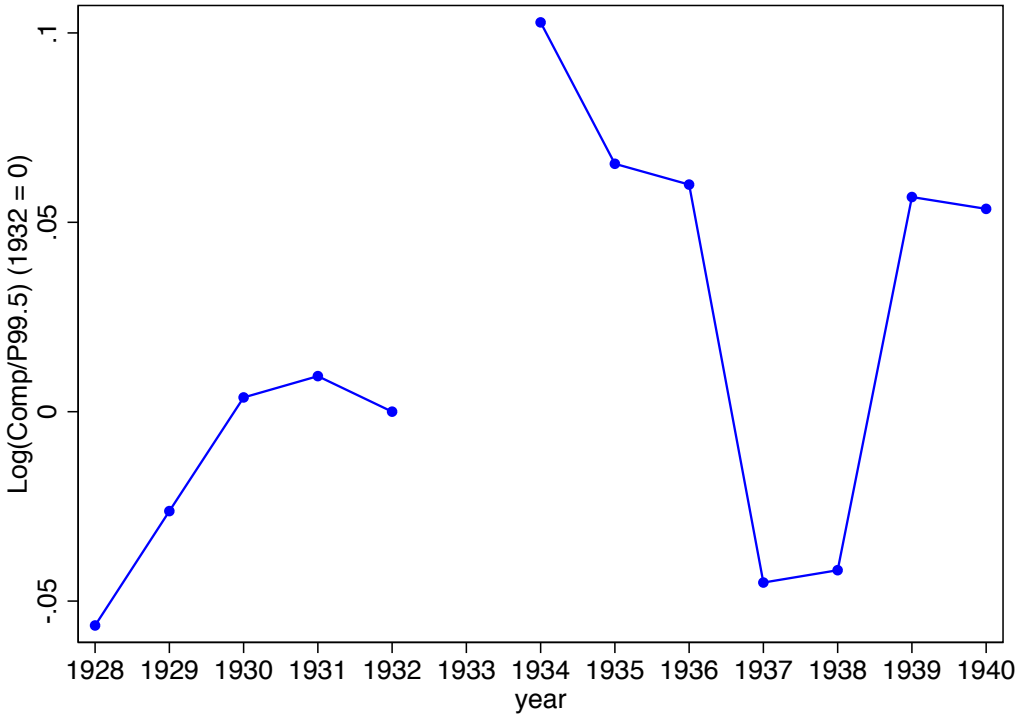


Note: Figure plots the natural log of CEO compensation relative to 1932.

Figure 2. Evolution of CEO pay in relation to the 99.5 fractile.

Note: The figure plots the natural log of the ratio or CEO compensation and the 99.5 fractile on the labor income distribution (excluding capital gains) relative to 1932.

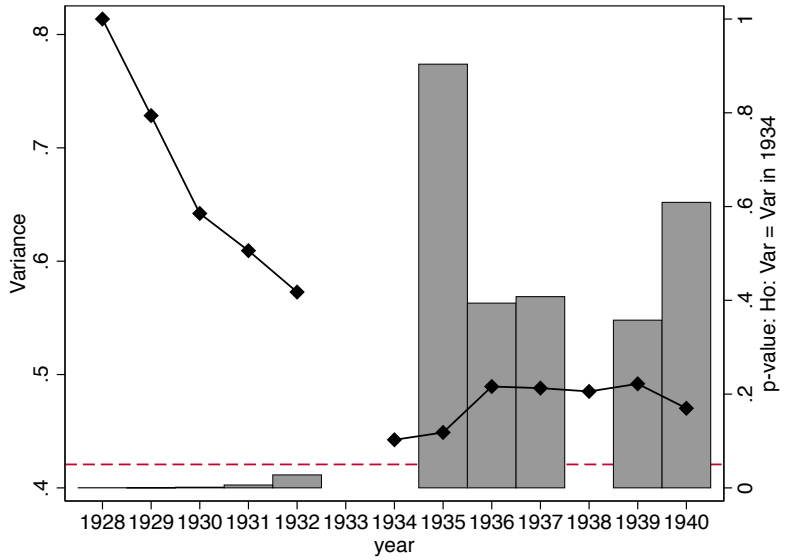
Figure 3. Evolution of CEO Pay in Relation to the 99.5 Fractile; Controlling for Firm Size



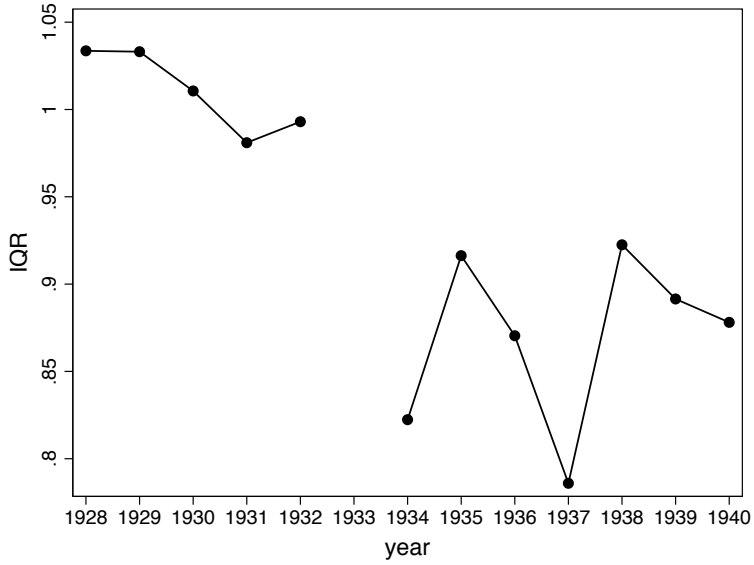
Note: The figure plots the natural log of the ratio or CEO compensation and the 99.5 fractile on the labor income distribution (excluding capital gains) controlling for ln(market value) in t-1, relative to 1932. See equation (1).

Figure 4. Dispersion of CEO compensation by year

Panel A. Variance

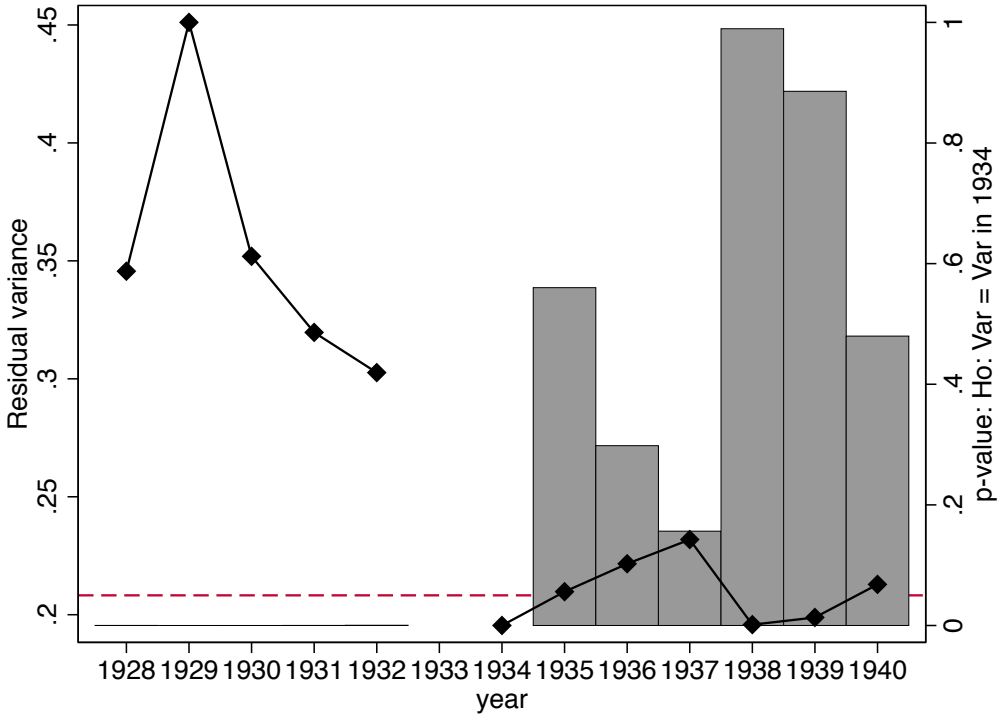


Panel B. Interquartile Range



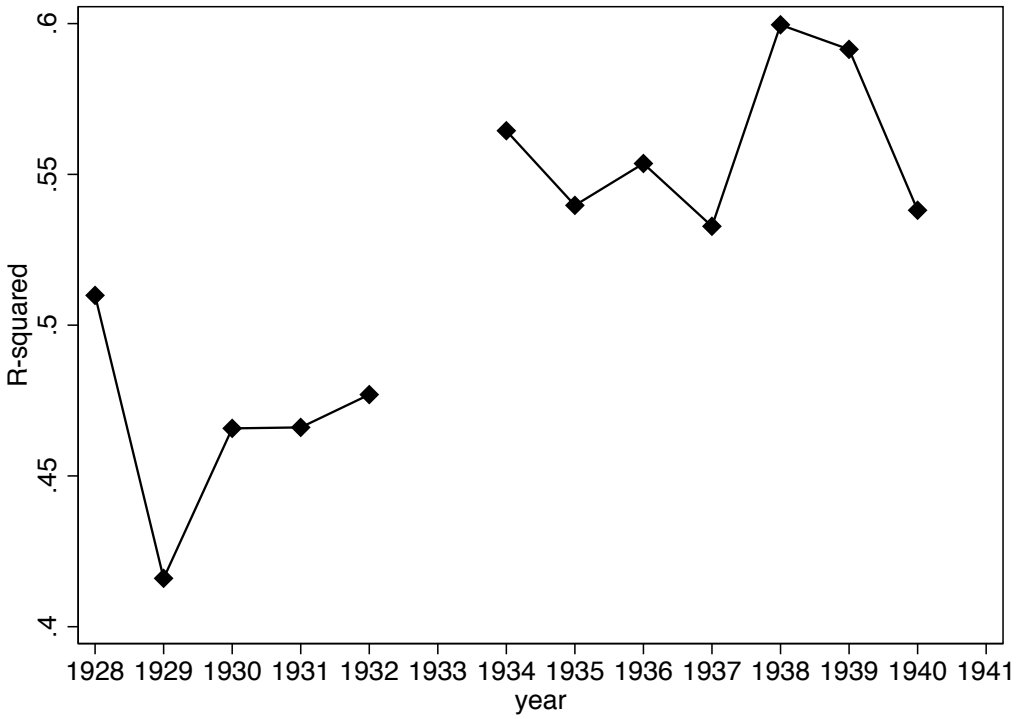
Notes: Panel A plots the variance of CEO compensation by year and Panel B plots the interquartile range.

Figure 5. Residual Variance of log CEO Compensation



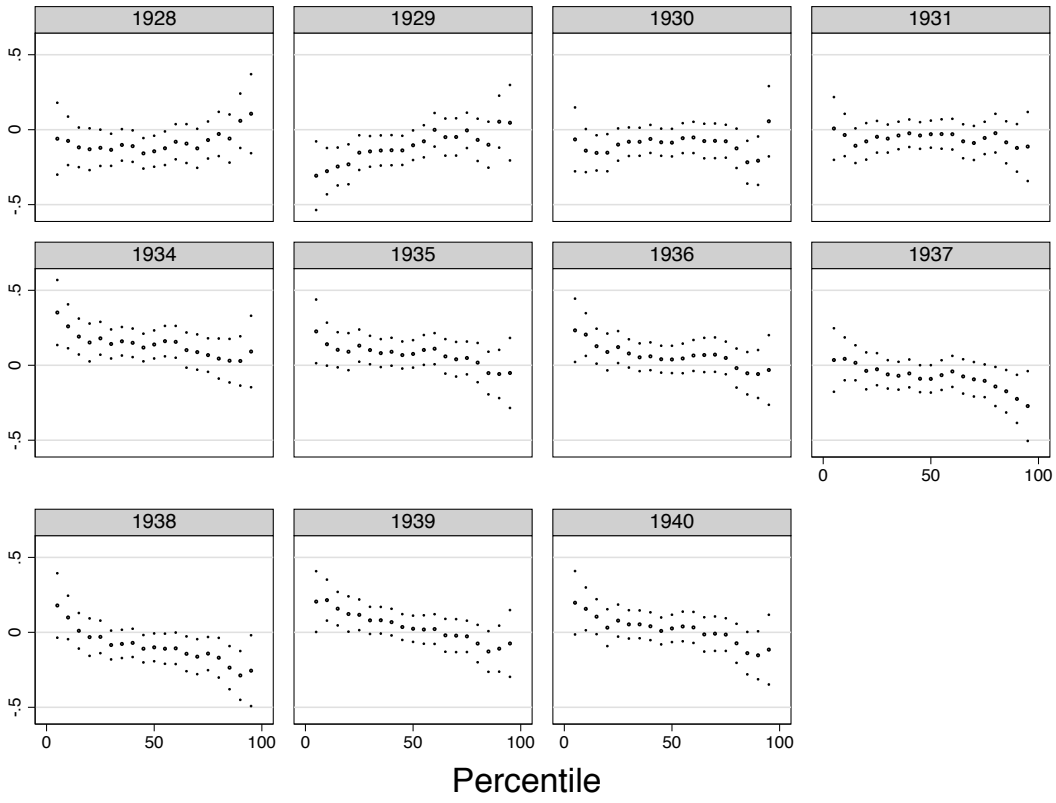
Notes: The figure plots the residual standard deviation of log CEO compensation. Residuals are computed by regressing log CEO compensation log market value in t-1 and 2-digit SIC dummies (equation 2). Bars indicate the p-value for the null that the standard deviation in a given year is equal to the standard deviation in 1934. The dashed red line demarcates a p-value of 0.05.

Figure 6. R-squared by year



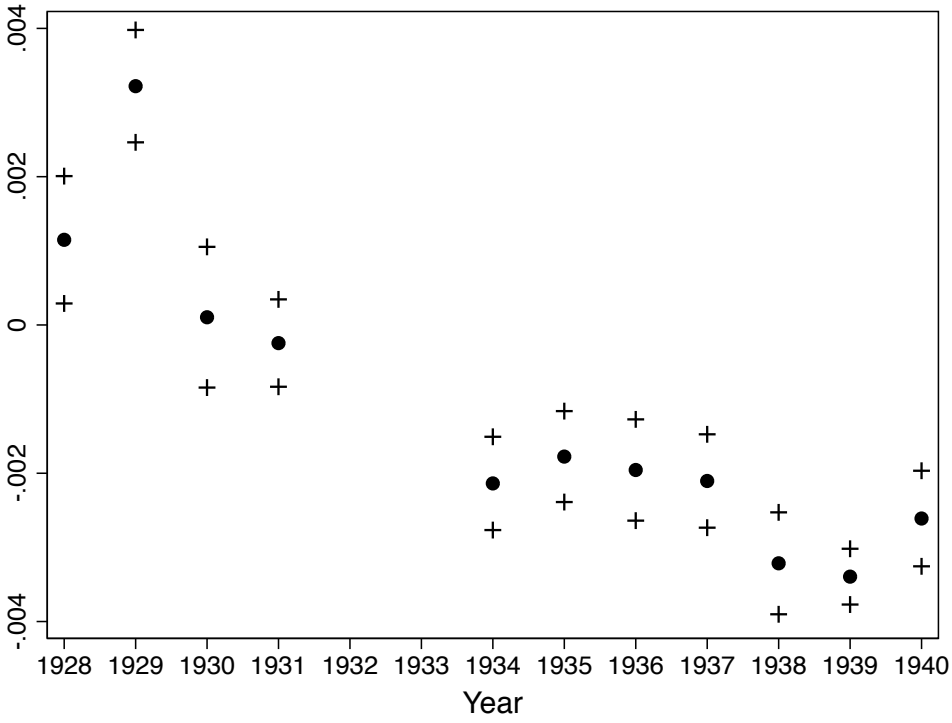
Notes: Each point is the R-squared from estimating equation (2) by year. Controls are log market capitalization in t-1 and 2-digit industry.

Figure 7. Conditional Quantile Response Controlling for Firm Size And Industry; Estimates are in Relation to the Quantile Response in 1932



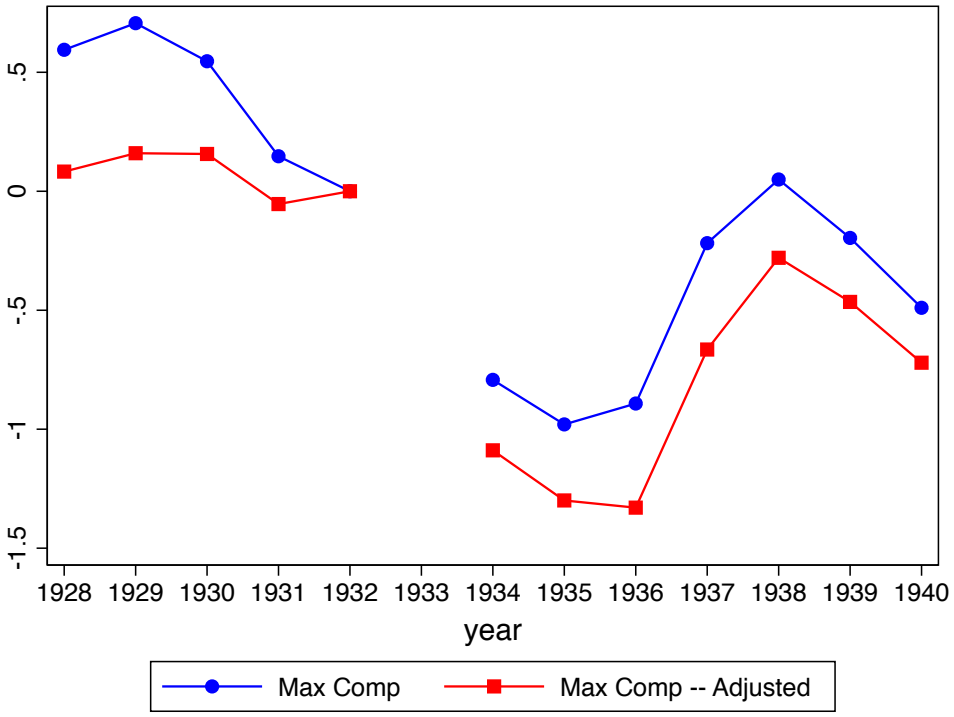
Notes: Figure reports conditional quantile estimates with log market capitalization in t-1 and 2-digit industry controls. Estimates (circles) are from equation (4) from the 5th to the 95th quantiles in intervals of 5. The outer markers are the 95% confidence interval.

Figure 8. Compression index



Notes: Each point is the slope of the points in the panels (for a given year) in Figure 8 estimated by OLS, weighted by the inverse variance of the estimates. The outer markers are the 95% confidence interval.

Figure 9. Evolution of Maximum Compensation



Notes: Max Comp is the log of the maximum compensation relative to 1932. Max Comp – Adjusted is Log maximum CEO compensation adjusted for firm size. To adjust for firm size I subtract 0.29 * log market capitalization from maximum compensation and express the resulting series relative to 1932.

Table 1. Descriptive Statistics

	(1) 1928-1932	(2) 1934-1940
CEO compensation	83774	63586
	[128914]	[57805]
Market capitalization	59.1	48.8
	[164.9]	[140.6]
99.5^{th} labor income fractile	8444	7380
	[789]	[527]
Percent of firms in:		
Metal Mining	0.3	0.3
Coal Mining	3.5	3.5
Food and Kindred Products	7.9	7.9
Tobacco Products	1.4	1.4
Textile Mill Products	3.8	3.8
Apparel, Finished Products from Fabrics	1.9	1.9
Lumber and Wood Products, Except Furniture	0.3	0.3
Paper and Allied Products	2.7	2.7
Printing, Publishing and Allied Industries	1.9	1.9
Chemicals and Allied Products	7.6	7.6
Petroleum Refining and Related Industries	5.7	5.7
Rubber and Miscellaneous Plastic Products	1.6	1.6
Leather and Leather Products	1.4	1.4
Stone, Clay, Glass, and Concrete Products	3.5	3.5
Primary Metal Industries	12.5	12.5
Fabricated Metal Products, Machinery And Transportation Equipment	3.8	3.8
Industrial and Commercial Machinery	10.1	10.1
Electronic, Electrical Equipment	4.1	4.1
Transportation Equipment	13.3	13.3
Control Instruments – Photo/Med/Opt Goods Watches/Clocks	1.4	1.4
Miscellaneous Manufacturing Industries	0.8	0.8
Communications	0.3	0.3
Wholesale Trade - Durable Goods	0.8	0.8
General Merchandise Stores	6.0	6.0
Food Stores	1.6	1.6
Eating And Drinking Places	0.3	0.3
Holding and Other Investment Offices	0.3	0.3
Motion Pictures	1.4	1.4
Observations	1589	2114

Notes: Standard deviations in brackets. Compensation and market capitalization are expressed in nominal terms.

Table 2. Evolution of CEO compensation (1932 = 0)

	ln(Real CEO Compensation)			ln(CEO Compensation/P99.5)		
	(1)	(2)	(3)	(4)	(5)	(6)
t=1928	0.046	0.048	-0.046	0.035	0.037	-0.056
	(0.049)	(0.047)	(0.048)	(0.049)	(0.047)	(0.048)
t=1929	0.194	0.185	-0.022	0.190	0.181	-0.026
	(0.041)	(0.040)	(0.050)	(0.041)	(0.040)	(0.050)
t=1930	0.185	0.195	-0.013	0.202	0.212	0.004
	(0.034)	(0.033)	(0.042)	(0.034)	(0.033)	(0.042)
t=1931	0.108	0.131	0.018	0.100	0.123	0.009
	(0.030)	(0.028)	(0.033)	(0.030)	(0.028)	(0.033)
t=1934	0.057	-0.011	0.033	0.127	0.059	0.103
	(0.036)	(0.030)	(0.032)	(0.036)	(0.030)	(0.032)
t=1935	0.086	0.017	0.003	0.148	0.079	0.065
	(0.034)	(0.031)	(0.031)	(0.034)	(0.031)	(0.031)
t=1936	0.158	0.092	0.060	0.158	0.092	0.060
	(0.037)	(0.034)	(0.034)	(0.037)	(0.034)	(0.034)
t=1937	0.178	0.113	-0.023	0.156	0.091	-0.045
	(0.037)	(0.034)	(0.037)	(0.037)	(0.034)	(0.037)
t=1938	0.162	0.095	-0.050	0.171	0.104	-0.042
	(0.037)	(0.034)	(0.036)	(0.037)	(0.034)	(0.036)
t=1939	0.136	0.143	0.102	0.091	0.098	0.057
	(0.033)	(0.032)	(0.032)	(0.033)	(0.032)	(0.032)
t=1940	0.105	0.189	0.140	0.018	0.103	0.054
	(0.041)	(0.036)	(0.034)	(0.041)	(0.036)	(0.034)
ln(Market Cap_{t-1})			0.215			0.215
			(0.025)			(0.025)
Fixed Effects		X	X		X	X
Observations	3699	3699	3371	3699	3699	3371
R-squared	0.01	0.73	0.79	0.01	0.73	0.79

Notes: Each estimate is compensation in that year relative to 1932. Standard errors clustered on firm in parentheses. P99.5 is the 99.5 fractile of the income distribution (excluding capital gains). Market capitalization is in millions of dollars.

Table 3. Pay-Performance Sensitivity and the Relationship between Firm Size and CEO Compensation, before and after Mandated Disclosure

	Δ CEO Compensation ($1000s)		log(CEO Compensation)	
	(1)	(2)	(3)	(4)
Δ market cap$_t$ ($millions)	0.264	0.342		
	(0.124)	(0.155)		
post***Δ** market cap$_t$ (millions$)		-0.281		
		(0.143)		
ln(market cap$_{t-1}$)			0.292	0.311
			(0.016)	(0.022)
post* ln(market cap$_{t-1}$)				-0.031
				(0.019)
Observations	2687	2687	3371	3371
R-squared	0.12	0.14	0.41	0.41

Notes: Standard errors clustered on firm in parentheses. Post is 1 for years 1934-1940. All models include year dummies.

Table 4. Variance and Residual Variance by Year

	Firms in both FTC and SALC Records					Balanced Sample 1928-1938				
	Variance (1)	p-value (2)	Residual variance (3)	p-value (4)	Obs (5)	Variance (6)	p-value (7)	Residual variance (8)	p-value (9)	Obs (10)
1928	0.81	0.00	0.35	0.00	295	0.74	0.00	0.28	0.00	95
1929	0.73	0.00	0.45	0.00	310	0.79	0.00	0.37	0.00	95
1930	0.64	0.00	0.35	0.00	334	0.73	0.00	0.28	0.00	95
1931	0.61	0.00	0.32	0.00	330	0.67	0.00	0.28	0.00	95
1932	0.57	0.00	0.30	0.00	320	0.61	0.00	0.30	0.00	95
1933	--	--	--	--		--	--	--	--	--
1934	0.44	--	0.20	--	275	0.41	--	0.13	--	95
1935	0.45	0.56	0.21	0.56	298	0.42	0.54	0.14	0.54	95
1936	0.56	0.30	0.22	0.30	303	0.45	0.37	0.15	0.37	95
1937	0.49	0.16	0.23	0.16	303	0.49	0.06	0.19	0.06	95
1938	0.49	0.99	0.20	0.99	284	0.47	0.39	0.15	0.39	95
1939	0.49	0.89	0.20	0.88	350	0.48	0.30	0.16	0.30	93
1940	0.47	0.48	0.21	0.48	297	0.44	0.38	0.15	0.38	77

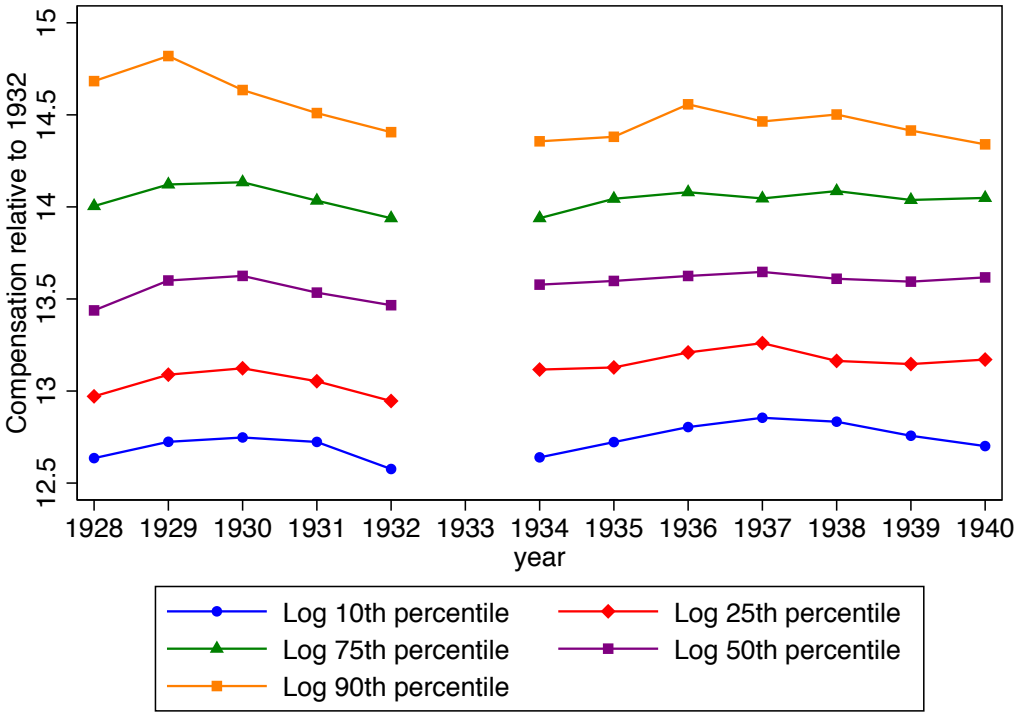
Notes: Variance refers to the variance of log CEO compensation. Residual variance is the variance of residuals from a regression of log CEO compensation on log market capitalization in t-1 and 2-digit industry, estimated separately in each year. p-value corresponds to the null that the variance and residual variance in a given year is equal to the 1934 value. Observations correspond to the variance columns.

Table 5. Relationship between pre-mandate residual, compensation level, and change in CEO compensation

	(1)	(2)
$Residual_{t-L}$*1(t=1934)	-0.193	-0.237
	(0.087)	(0.099)
ln(CEO $Comp_{t-L}$) *1(t=1934)	0.040	-0.021
	(0.057)	(0.075)
$Residual_{t-L}$	-0.244	-0.246
	(0.042)	(0.052)
ln($Comp_{t-L}$)	-0.053	-0.075
	(0.023)	(0.032)
1(t=1934)	-0.525	0.103
	(0.612)	(0.820)
Δln(market cap_t)	0.162	0.102
	(0.017)	(0.023)
Constant	0.614	0.857
	(0.248)	(0.343)
Observations	1410	891
R-squared	0.24	0.25
L=2	X	
L=3		X

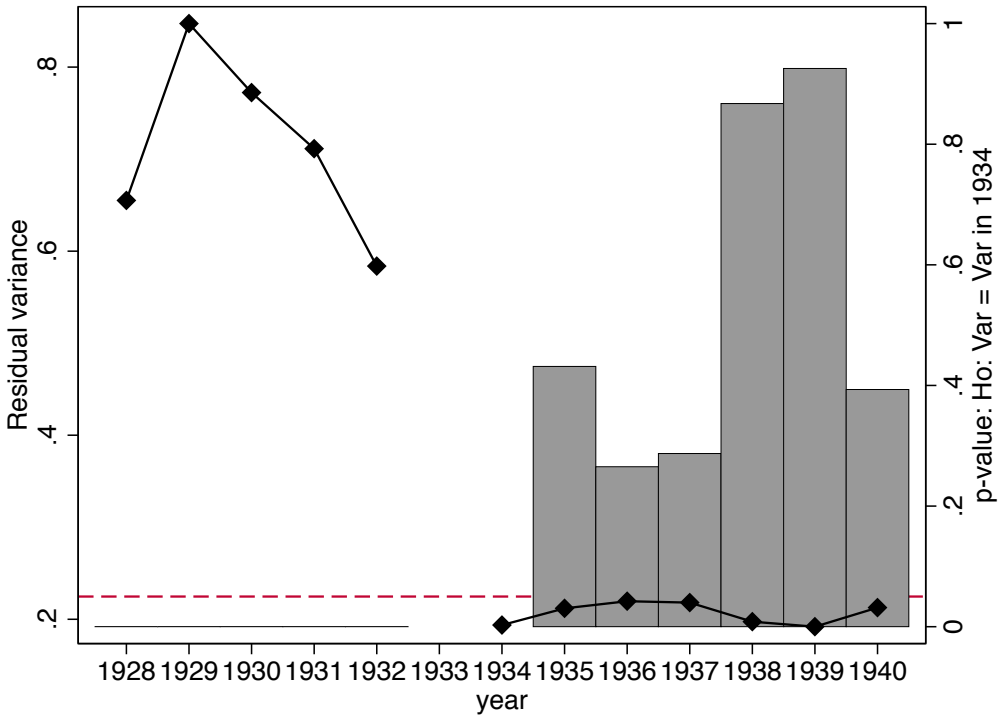
Notes: Standard errors clustered on firm in parentheses. "L" denotes the years of lag. In column (1) the model is estimated over years 1930, 1932, 1934, 1936, 1938 and 1940. In column (2) the model is estimated over 1931, 1934, 1937, and 1940. Residual is the residual of a regression of log CEO compensation on lagged market value and 2-digit industry, calculated separately each year. ln(Comp) is the natural log of CEO compensation. The dependent variable is the two year change in ln(Comp/P99.5) in column (1) and the three year change in ln(Comp/P99.5) in column (2).

Appendix Figure 1. Percentiles of real log CEO compensation.



Notes: CEO Compensation is in 2012 dollars.

Appendix Figure 2. Residual variance by year; Full-sample



Notes: See notes to Figure 5.