A Job Ladder Model of Executive Compensation

Online Appendix

Bo Hu

A1. Merging ExecuComp and BoardEx

To merge ExecuComp and BoardEx, I use an executive's full name (first, middle, and last names), date of birth, periods of employment in ExecuComp, and periods of employment in BoardEx. I check whether the two datasets share the same job episodes; that is, whether the executive is listed both as a named officer in an ExecuComp firm and in the BoardEx database with the same job title during the same period. When all three pieces of information (name, date of birth, and job history in ExecuComp and BoardEx) are consistent, I know that I have identified the same executive in both ExecuComp and BoardEx and can link the relevant observations.

For the empirical analysis below, I use a sample of 47,716 executives from ExecuComp, corresponding to a total of 275,611 executive-fiscal-year records spanning from 1992 to 2016. My dataset is not a balanced panel because an executive is only included when she holds a position as a named officer at a publicly listed firm. In my sample, each executive has an average of 5.78 fiscal-year records. Using the method outlined above, I have successfully matched 34,089 executives, corresponding to 217,588 executive-year records. The matched sample accounts for 71.44% of the executives and 78.95% of the executive-year records in ExecuComp.

Table A1: A comparison of matched and unmatched samples

	obs.	male	age	CEO	CFO	totalpay *(thousands)*	mktcap *(millions)*
Not matched	58,023	0.96	51.5441	0.1585	0.1257	1967.659	5131.856
Matched	217,588	0.9323	51.7282	0.2182	0.1688	2543.8423	8375.874

Note: This table compares the means of key variables in the matched and unmatched samples. *Male* is a binary indicator variable, which takes value 1 if the executive is a male. *Age* represents the executive's age at the end of the fiscal year. The dummy variables *CEO* and *CFO* indicate whether the executive held the position of CEO or CFO during the fiscal year, respectively. *Totalpay* refers to the awarded value of total compensation, which includes salary, bonus, other annual compensation, the total value of restricted stock granted, the total value of stock options granted (calculated using the Black-Scholes model), long-term incentive payouts, and all other forms of compensation. The unit is thousand dollars. *Mktcap* (market capitalization) is calculated by multiplying *csho* (common shares outstanding) by *prcc_f* (fiscal year-end price). The unit is million dollars. Both *prcc_f* and *csho* are sourced from the Compustat Fundamentals Annual file.

Table A1 shows the differences in the key variables in matched and unmatched samples. The two samples exhibit similar characteristics, with 93% of the matched sample and 96% of the unmatched sample comprising male executives. The average age is also nearly identical, with both

samples averaging 52 years. In terms of executive titles, 22% of the matched records are CEOs, and 17% are CFOs, being slightly higher than the percentages in the unmatched sample. The average awarded total compensation in the matched sample is $2,544 thousand, compared to $1,968 thousand in the unmatched sample. The matched records have an average market capitalization of $8,376 million, whereas the unmatched sample has an average market capitalization of $5,132 million.

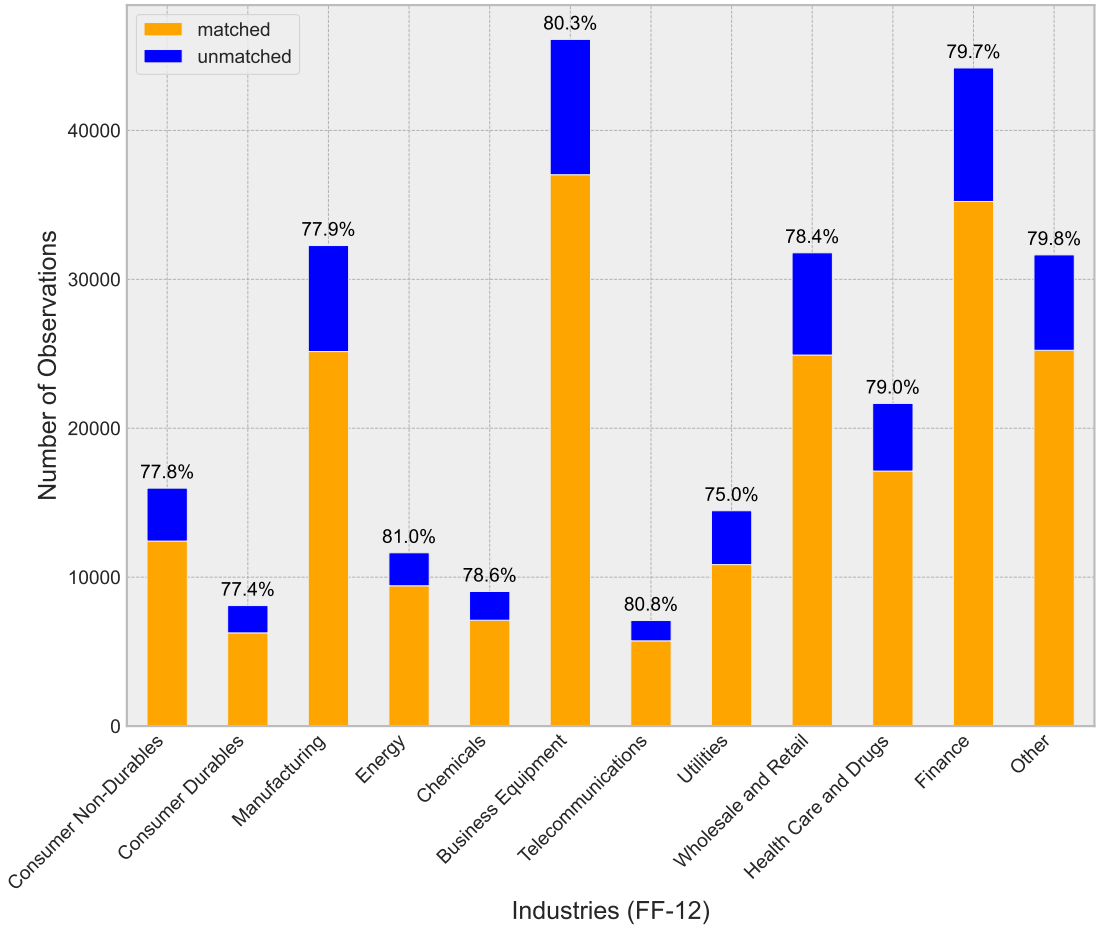

Figure A1: Matched and unmatched observations across the Fama-French 12-industry classification

Figure A1 further examines the numbers of matched and unmatched observations across the Fama-French 12-industry classification, with the percentage of matched observations given at the top of each bar. The figure shows that the percentage of matched observations consistently ranges around 80% across all 12 industries.

Overall, while BoardEx tends to include executives from relatively large companies with high-ranking titles and high levels of compensation, the difference between matched and unmatched observations is moderate. The matched sample is broadly representative regarding gender, age, and industry distribution. However, it is important to note that executives who re-

ceive lower levels of compensation and who work for smaller firms are more likely to undergo job transitions (see Fact 3). As a result, the job-to-job transition rate calculated from the matched records may underestimate the true rate. This suggests that the impact of job transitions could be even larger than what is documented in this paper.

A2. Data Summary Statistics

This section describes the variables that are constructed from ExecuComp (including observations that are not matched with BoardEx). The summary statistics are reported in Table A2. All nominal quantities are converted into constant 2004 dollars. Using information from ExecuComp, I identify key executive characteristics such as *gender*, *age*, and *tenure* in the current executive job episode. I also identify whether the executive holds positions such as *CEO*, *CFO*, or *director* of the board, and additionally, whether the executive is involved in an *interlock* relationship during the fiscal year. The data reveals that 93.81% of the executives in this sample are male, with an average age of 52 years. The average length of a job episode is 4.54 years. In the executive–year observations, 15.87% of the executives hold a CEO title and 7.75% hold a CFO title.

Regarding compensation information, *salary* refers to the annual fixed salary, while *incentive pay* encompasses the performance-related pay included in annual compensation. *Total pay* is the $TDC1$ in ExecuComp; it includes salary, bonuses, the value of stock and options granted, and other forms of compensation. The average total pay is $2,355$ thousand, with the 25th percentile at 558 thousand and the 75th percentile at $2,440$ thousand. inc^f measures the percentage of *incentive pay* in *total pay*. On average, 57.65% of the total pay is incentive-related.

Performance-based incentives not only come from the executives' annual pay, they also come from the stocks and options that are granted to the executive in previous years. *inc* quantifies the strength of performance-based incentives in executives' firm-related wealth, defined as the dollar change in wealth for a 100 percentage point change in the firm's stock price. The share of *inc* in annual total pay is defined as $inc^s = \frac{inc}{total\,pay}$.

Firm-level information includes *market capitalization* (*mktcap*), which measures firm size as the market value of outstanding shares. For robustness checks, I also use the book value of assets (*at*) and *sales* to measure firm size. All are denominated in million dollars. *Operating profitability*, denoted as *profitability*, measures firm performance. Additional performance measures include the stock market annualized return (*annual return*) and market-to-book ratio (*mbr*).

Table A2: Summary Statistics of ExecuComp/Compustat Variables

Variable	*Obs.*	*Mean*	*Std. Dev.*	*25th Pctl*	*50th Pctl*	*75th Pctl*
age (years)	227,400	51.6810	8.1626	46	52	57
male	275,600	0.9381	0.2409	1	1	1
CEO	275,600	0.1587	0.3654	0	0	0
CFO	275,600	0.0775	0.2673	0	0	0
director	275,600	0.2954	0.4562	0	0	1
interlock	275,600	0.0126	0.1114	0	0	0
tenure (years)	275,600	4.5497	3.7585	2	3	6
salary (thousands)	275,600	400.1009	289.7745	221.6080	327.3530	500
incentive pay (thousands)	245,700	1790.5430	4848.5026	230.3400	679.2000	1771.2729
total pay (thousands)	245,700	2354.5641	5159.5031	557.9830	1135.2335	2439.5020
inc	182,400	34523.5860	540,700	1537.0074	4596.6157	14218.0771
inc^s	181,883	9.0741	22.4213	1.7503	3.6788	7.5513
inc^f	245,400	57.6539	25.9884	42.2494	62.9536	77.3157
mktcap (millions)	268,800	7697.1540	25200.0861	585.2338	1576.0022	4984.0161
at (millions)	273,500	14301.2222	90675.6603	516.7030	1696.4860	6117.1000
sales (millions)	273,400	5179.5732	16393.0714	425.4610	1187.2990	3750
profitability (%)	265,600	0.1195	0.4250	0.0708	0.1217	0.1770
annual return (%)	267,300	0.1824	0.7829	-0.1285	0.1045	0.3565
market-book ratio	233,100	1.6667	2.2183	0.8046	1.1855	1.8986

Note: The table reports summary statistics for the ExecuComp/Compustat dataset, which includes named executive officers reported in ExecuComp from 1992 to 2016. All dollar values are adjusted to 2004 dollars. *age* represents the executive's age at the end of the fiscal year. The dummy variables *CEO*, *CFO*, *director*, and *interlock* indicate whether the executive served as a CEO, CFO, or director of the board, or whether they were involved in an interlocking relationship during the fiscal year, respectively. *tenure* (in years) measures the number of fiscal years the executive has served as a named officer. *total pay* ($TDC1$ in ExecuComp) represents total compensation, which includes salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using the Black–Scholes model), long-term incentive payouts, and all other total. *salary* is the annual fixed salary component of the compensation package. *incentive pay* refers to the performance-related pay within the annual compensation package. inc^f is the fraction of total pay that is incentive-related, calculated as $inc^f = \frac{incentivepay}{totalpay}$. *inc* is the change in wealth (in million dollars) associated with a 100 percentage point change in stock price. inc^s is the share of performance-based incentives in the total pay, calculated as $inc^s = \frac{inc}{totalpay}$. *mktcap* (in millions) represents the market capitalization of the company, calculated by multiplying *csho* (common shares outstanding, in millions of shares) by *prcc_f* (fiscal year-end price). Both *prcc_f* and *csho* are reported in the Compustat Fundamentals Annual file. *at* (in millions) represents the total book assets as reported by the company. *sales* (in millions) denotes the net annual sales as reported by the company. *profitability* is calculated as operating profitability (EBITDA/assets). *annual return* represents the annualized stock return, compounded based on CRSP monthly stock file returns, which have been adjusted for splits and other corporate actions. *market-book ratio* is the market-to-book ratio, calculated as the market value of assets divided by total book assets. The market value of assets is calculated using the formula $MVA = prcc\_f \times cshpri + dlc + dltt + pstkl - txditc$.

A3. Defining Job-to-job Transitions

For each executive-year observation, I define the end-of-year status as follows. If executives remain at the same firm in the following year, their status is marked as continuing. If they leave their current firm and take up an executive position at another firm within six months after their current ExecuComp spell ends, their status is recorded as a job transition. If there is no subsequent executive job recorded in BoardEx within six months, the executive's end-of-year status is marked as an exit from the labor market.

Table A3: End-of-year status of the matched observations

Status	obs.	share (%)
Continuing	179,497	82.49
Job transition	9,094	4.17
To publicly listed firm	2,584	1.19
To non-listed firm	6,510	3.00
Exit	20,621	9.48
Permanent exit	12,925	5.94
Re-entering market with gap	6,696	3.08
Not identified	8,376	3.85

Note: This table lists the number and percentage share of observations for each end-of-year status of executives. "Continuing" refers to executives who remain at the same firm in the following year. "Job transition" indicates that executives leave their current firm and assume an executive position at another firm within six months after their current ExecuComp record ends. Job transitions are further categorized based on whether the destination firm is publicly listed or non-listed. "Exit" represents executives who do not take another executive job within six months. Exits are further categorized as "Re-entering with a gap" if the executive takes another executive position after six months, or "Permanent exit" if no subsequent executive job is recorded. Observations for executives who have not reached the end of the fiscal year by the time of data collection are categorized as "Not identified."

Table A3 shows the number of observations and the corresponding share for each end-of-year status. Among a total of 217,588 matched executive-year observations, 179,497 are identified as continued employment in the same firm, 20,621 are identified as exits from the executive labor market, and 9,094 are identified as job transitions. Of the job transitions, 2,584 are transitions to publicly listed firms, and 6,510 are to non-listed firms. This suggests that transitions between private and listed firms are common, a phenomenon that warrants further examination in future studies.

Among the exits, 12,925 are permanent exits from the labor market, meaning no subsequent executive positions are found in BoardEx after the end of the current ExecuComp job. The remaining 6,696 cases involve executives who re-enter the market after a gap ranging from six months to several years.[26] As of the date of data access, 8,376 observations had not yet reached the end of the fiscal year, and their end-of-year status is marked as *not identified*. These observa-

[26]The gap between the end of the ExecuComp job record and the executive's next job has a mean of 1,178 days and a median of 822 days. Among the 6,696 cases, 1,092 have a gap of less than 366 days. One might label some of the "re-entering the market with a gap" cases as unemployment, assuming these individuals are actively seeking executive positions. However, I believe that the nature of unemployment for executives is inherently different from unemployment in the broader labor market. Since executive unemployment is not the focus of the following analysis, I treat "re-entering with a long gap" as a form of exit.

tions will not be included in the subsequent analysis.

A4. Supplementary Empirical Results

A4.1 Distribution of Firm Size Changes Following Executive Transitions

Figure A2 examines the distribution of changes in firm size upon executive transitions. In addition to a higher proportion of transitions to larger firms, there are a significant number of "leap" transitions; that is, where the target firm is much larger than the original firm. This pattern supports that the managerial labor market can be modeled as a random search frictional market.

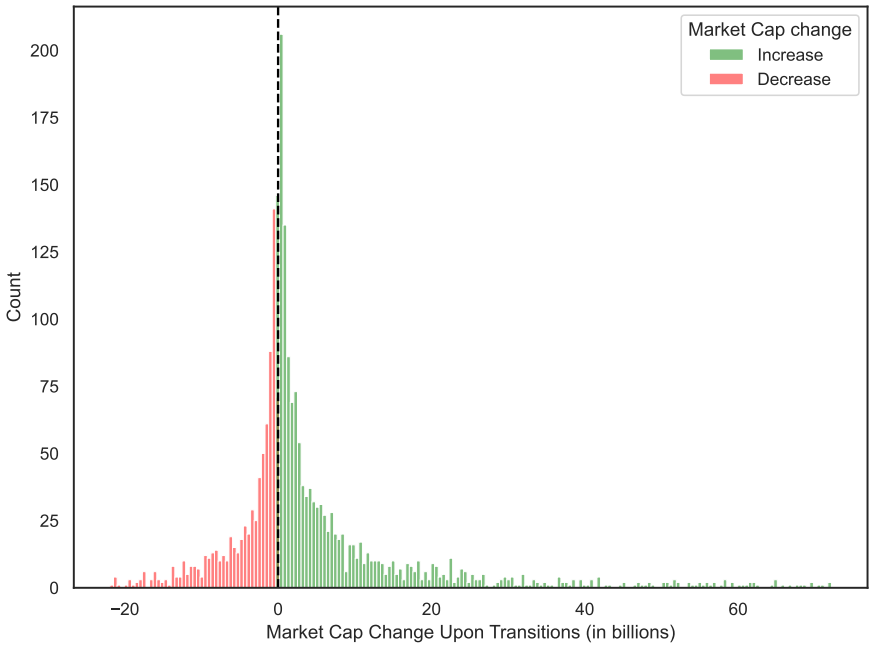

Figure A2: Changes in firm size upon job-to-job transitions

Note: This bar plot illustrates the distribution of changes in firm size (measured by market capitalization in billion dollars), with increases in firm size depicted in green and decreases in red.

A4.2 Incentive Premia Identification: Between-firm Variations

It is worth noting that the incentive premia presented in the paper are primarily identified by the between-firm variations; this is because the industry-specific year dummies have been controlled. To further validate the sources of identification, I run the regression in Table 2, Column (2), separately for each year and plot the estimated yearly premia. The orange dots represent the estimates, and the shaded region represents the 95% confidence interval. The yearly premia range from 0.2 to 0.6, with an average that is closely aligned with the estimated premium of 0.3581 reported in Table 2, Column (2). I also plot the yearly estimates for the coefficient of $\log(mktcap)$ when total compensation ($totalpay$) is not controlled. It shows a similar level to the

estimated coefficient of 0.6186 reported in Table 2, Column (1). In conclusion, my results are robust to using only between-firm variations.

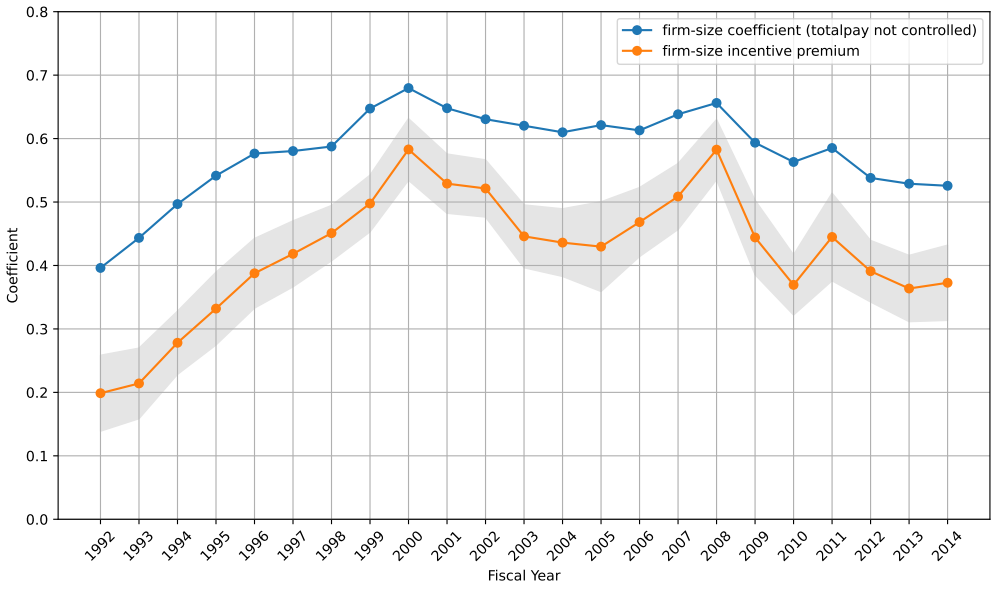

Figure A3: Year-by-year estimation of firm-size incentive premia

Note: The figure shows the estimates of the coefficients of $\log(mktcap)$ by running the regressions of Table 2, Columns (1) and (2), separately for each year. The blue dots represent the yearly estimates for the coefficient of $\log(mktcap)$ in Column (1). The orange dots represent the coefficient of $\log(mktcap)$ in Column (2), with the shaded region indicating the 95% confidence interval.

A4.3 Additional Empirical Facts

To further support my explanation, I present two more empirical facts that are not easily reconciled with the alternative explanations discussed in Section 5.

Fact 7. *The firm-size incentive premium is more pronounced among younger executives.*

I use age as a proxy for the likelihood of job transitions. Ever since the seminal work by Gibbons and Murphy (1992), *age* has been widely recognized as an indicator of career concerns. My model adopts a perpetual-youth framework that excludes age and life-cycle considerations. However, this framework can be conceptually extended to include age as a characteristic influencing the arrival rate of poaching offers. Specifically, assume that age has no direct impact on productivity but that λ decreases with age. If the firm-size incentive premium is indeed driven by the likelihood of job transitions, as my model suggests, we would expect the premium to be smaller among older executives. This hypothesis is supported by the data, as shown in Figure A4, where I compare the (conditional) firm-size incentive premium across different age groups. The premium starts at 0.652 for executives aged around 35 and gradually declines to approximately 0.35 after the age of 50. This pattern remains consistent with or without additional controls.

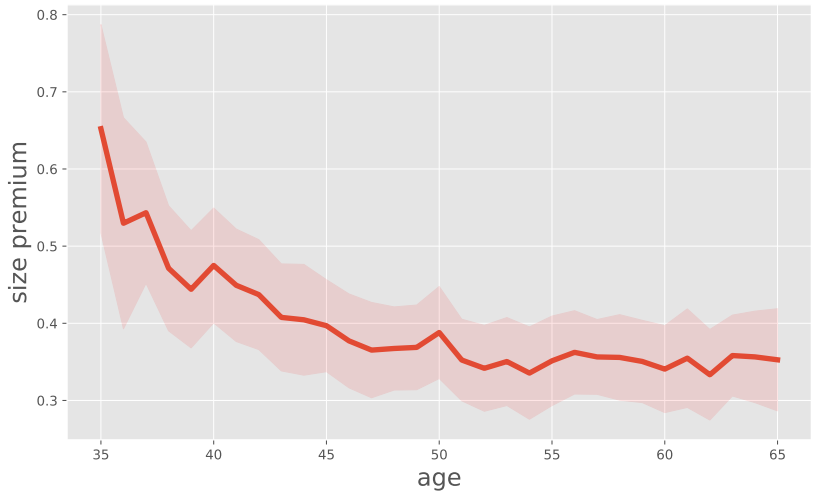

Figure A4: Firm-size incentive decreases in executive age

Note: The figure depicts the firm size incentive premium for *inc* at each age from 35 to 65. They are the estimated coefficients of the interaction terms between *age dummies* and *log(firm size)* in the following regression:

$$log(inc)_{it} = \Phi' age\ dummies_{it} \times log(mktcap)_{it} + \Psi' X_{it} + \epsilon_{it}.$$

Here, i denotes an executive, t denotes the fiscal year, *age dummies* is a set of dummy variables for each age from 35 to 65, *firm size* is measured by the market capitalization, and X denotes a vector of control variables and a constant term. I control for $total pay$, year times industry dummies. A 95% confidence interval is plotted using the standard error clustered on firm $\times$ fiscal year.

Fact 8. *Wage back-loading is more pronounced in larger firms.*

My model predicts that larger firms exhibit stronger wage back-loading due to their greater capacity to counter outside offers. This positive correlation between firm size and wage back-loading is crucial for my story. Specifically, higher expected future compensation triggers the wealth effect, which causes poaching-offer incentives to decrease with firm size (assuming sufficient concavity of the utility function, as detailed in Proposition 2). In contrast, the alternative explanations above do not address the dynamics of job search or the trajectory of executive compensation, leaving them silent on how firms back-load wages.

I measure the extent of wage-backloading by the annual growth rate of total compensation. In ExecuComp, total compensation is measured in two ways: the awarded value ($TDC1$ in ExecuComp) and the realized value ($TDC2$ in ExecuComp). The awarded value is an estimate based on the expected worth of stock and options at the time they are granted, before any actual company performance is realized. I have been using the awarded value, denoted as $total pay$, to control for the expected compensation level. The realized value captures the actual compensation received by executives, including the vested or exercised value of stock options and other long-term incentives. This value reflects the market performance of the company's stock and the decisions made by the executive to exercise stock options. Since the distinction between these two measures may matter when measuring wage backloading, I calculate the pay growth using both metrics. For this table, I denote $TDC1$ as the *awarded pay*, and $TDC2$ as the *realized pay*. I

Table A4: Wage back-loading and firm size

	$\Delta \log(awarded\ pay)$		$\Delta \log(realized\ pay)$	
	(1)	(2)	(3)	(4)
$\log(mktcap)$	0.1221***	0.1503***	0.1336***	0.1502***
	(0.0089)	(0.0098)	(0.0055)	(0.0064)
$\log(awarded\ pay)$	-0.3297***	-0.4130***		
	(0.0197)	(0.0221)		
$\log(realized\ pay)$			-0.3755***	-0.4439***
			(0.0160)	(0.0170)
CEO		0.2948***		0.2560***
		(0.0122)		(0.0117)
CFO		0.0365***		0.0207*
		(0.0050)		(0.0088)
director		0.1241***		0.1640***
		(0.0123)		(0.0126)
mbr		0.0013		0.0325***
		(0.0045)		(0.0062)
profitability		0.0318		0.1274*
		(0.0237)		(0.0520)
Obs.	183211	153432	209230	175600
adj. R^2	0.188	0.233	0.226	0.266

Note: The dependent variables are the annual growth rate of awarded total compensation ($TDC1$ in ExecuComp) in the first two columns and the annual growth rate of realized total compensation ($TDC2$ in ExecuComp) in the last two columns. Columns (1) and (3) control for the total compensation, age, and year-by-industry dummies. In Columns (2) and (4), additional controls include dummies for CEO, CFO, and director positions, as well as the market-to-book ratio (*mbr*) and earnings profitability ($profitability$). Statistical significance is denoted as follows: $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$.

further denote the growth rates as $\Delta \log(\textit{awarded pay})$ and $\Delta \log(\textit{realized pay})$.

To examine the relationship between wage backloading and firm size, I regress $\Delta \log(\textit{awarded pay})$ and $\Delta \log(\textit{realized pay})$ on firm size, and control for the executive's total compensation. The results are presented in Table A4. The results are consistent across all columns. For instance, in Column (1), the coefficient on $\log(\textit{mktcap})$ suggests that, starting from the same level of total compensation, a 1% increase in firm size is associated with a 12.21% increase in the compensation growth rate. In Columns (2) and (4), the estimated coefficients for firm size are even larger when additional controls are included, including firm performance metrics (market-to-book ratio, operating profitability) and position dummies (CEO, CFO, director).