Online Appendix for "Why has CEO pay increased so much?"

Xavier Gabaix and Augustin Landier

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In the section II.A, we say that when CEO impact is permanent, the marginal impact is the net present value of the increase in earnings. This is close to the market value, but it is not quite the market value, as the market value is the NPV of future earnings net of future CEO pays. This appendix justifies this claim.

The market value of the firm is:

$$V = \max_{\text{Future actions}} E\left[\sum_{t=1}^{\infty} \frac{a_t - w_t}{R^t}\right]$$

where a_t are the firm's earnings, w_t is the wage of the future CEO, and the value is optimized on future actions, such as CEO hires.

We observe that the CEO compensation is typically a small fraction of the earnings, at least for large and mature firms. To quantify this fraction, we study the top 500 firms for each year in 1992-2003, and compute the median value of the CEO compensation of a firm divided by earnings of that firm (if earnings are 0, we replace this value by the maximum in the sample, to give a conservative estimate for w/a). We find a median value of 0.49%. If we compute the sum of CEO compensation, divided by the sum of earnings, for each year, we find an average of 0.45%. Those numbers are smaller than in Bebchuk and Grinstein (2005), a study which includes also very small firms, which can have no earnings.

We summarize this empirical fact by saying that, for large firms at least, $0 \leq w_t \leq \varepsilon a_t$, with ε some small number, say less than 1%.

Suppose that the earnings follow:

$$a_{t+1} = a_t G_{t+1} e^{a_t^{\gamma-1} C T_t} \tag{35}$$

If the impact of talent in a given year is moderate ($a_t^{\gamma-1} C T_t \ll 1$, which is realistic at the horizon of 1 year), we obtain: $a_{t+1} = G_{t+1}\left(a_t + a_t^{\gamma-1} C T_t + o\left(a_t^{\gamma-1} C T_t\right)\right)$, an impact of talent that scales like $C a_t^{\gamma}$, as in the paper. The impact of hiring at time 0 a CEO of talent T_0 is:

$$\frac{\partial a_1}{\partial T_0} = a_1 \cdot C a_0^{\gamma-1}$$

We next consider the cases $\gamma = 1$ and $\gamma \in (0,1)$. The case $\gamma = 1$ is the simplest.

Case $\gamma = 1$. Eq. 35 gives:

$$\frac{\partial a_{t+1}}{\partial a_t} = \frac{a_{t+1}}{a_t}$$

so, by induction on t,

$$\frac{\partial a_t}{\partial T_0} = C a_t$$

so that

$$\frac{\partial V}{\partial T_0} = E\left[\sum_{t=1}^{\infty} \frac{\partial a_t / \partial T_0}{R^t}\right] = CE\left[\sum_{t=1}^{\infty} \frac{a_t}{R^t}\right]$$

That implies:

$$\frac{\partial V}{\partial T_0} = k_V V \text{ with } k_V \in [1-\varepsilon, 1]$$

Hence, the marginal impact of CEO talent is very close to the market capitalization, though not exactly equal to it.

Case $\gamma < 1$. The same reasoning can be transposed to $\gamma \in (0,1)$, albeit in a more cumbersome manner. Now, $\frac{\partial a_1}{\partial T_0} = C a_0^{\gamma-1}$, and

$$\frac{\partial a_{t+1}}{\partial a_t} = \frac{a_{t+1}}{a_t}\left(1 + (\gamma-1)\, a_t^{\gamma-1} C T_t\right) \sim \frac{a_{t+1}}{a_t}$$

where the later asymptotics holds because CT is small, or $\gamma < 1$ and a_t is large (we study the upper tail of the firms size distribution). By induction on t, we obtain:

$$\frac{\partial a_t}{\partial T_0} \sim a_t a_0^{\gamma-1}$$

so that (using the fact that $a_t^{\gamma-1} C T_t = o(1)$ uniformly in t, in the limit of large a or low CT)

$$\frac{\partial V}{\partial T_0} = E\left[\sum_{t=1}^{\infty} \frac{\partial a_t / \partial T_0}{R^t}\right] \sim E\left[\sum_{t=1}^{\infty} \frac{a_t}{R^t}\right] C a_0^{\gamma-1} = CkV a_0^{\gamma-1} = KCV^{\gamma}$$

with $K = \left(\frac{V}{a_0}\right)^{1-\gamma} k$. The impact is proportional to V^{γ}, times the price-earnings ratio V/a_0, to the power $1-\gamma$, times the value $k \in [1-\varepsilon, 1]$. Hence, it typically scales at V^{γ}.

top 1000 firms	ln(total compensation)	
ln(market cap)	0.372	0.374
	[14.51***]	[14.47***]
	[27.75***]	[24.73***]
ln(market cap # 250)	0.712	0.716
	[11.69***]	[12.43***]
	[12.52***]	[12.30***]
GIM	0.024	0.021
	[2.30**]	[1.58]
	[7.32***]	[9.87***]
stock-return	0.464	
	[3.30***]	
	[3.13***]	
market return		0.222
		[0.68]
		[1.96**]
GIM*stock-return	-0.014	
	[0.88]	
	[0.88]	
GIM*market return		0.006
		[0.17]
		[0.66]
Observations	6362	6393
R-squared	0.34	0.33

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

The data is the same as in Table II of the paper. Stock return is the stock return of the CEO's firm and market return is the value-weighted return of the 1000 firms.

Figure VI: Supplementary Table: Interaction between governance and stock market return. This Table presents the results discussed in section III.B of the paper, when discussing the interaction between governance and stock market returns.