Internet Appendix for "The Case For Intervening In Bankers' Pay" *

This Internet Appendix provides further empirical evidence and further calibration details which justify the analysis provided in the published text. The plan of the Internet Appendix is as follows. Section I compares the level of pay as a proportion of shareholder equity between banks and non-financial institutions. Section II studies the level of shareholder equity as a proportion of total assets for commercial banks and for other financial institutions. Section III describes the detailed steps taken to calibrate the maximally weak bonus caps for the sample of 20 banks provided by Acharya, Gujral, and Shin (2009).

I. Pay As A Proportion of Shareholder Equity

In Section IV.D of the published text I conduct a calibration to assess the importance of remuneration to a typical financial institution's default risk. This calibration uses as a central estimate that remuneration by a bank is 20% of shareholder equity. This figure comes from a histogram of the data set of banks and financial institutions traded on the NYSE presented in Figure 3. In this section I seek to put the statistics on pay in the banking sector into context when compared to general firms across all sectors. Figure IA.I depicts the levels of remuneration as a proportion of shareholder equity for all North American firms contained in Compustat in 2007. The plot depicts the frequency of different remuneration levels across the full sample. This is compared to the frequency graph for the data set of banks and financial institutions traded on the NYSE between 1998 to 2009 used in Section IV.[1] Figure IA.I demonstrates that the pay of typical U.S. firms is skewed to the left of that for banks and financial institutions. Thus, banks and financial institutions pay typically a little more than a typical U.S. firm as a proportion of shareholder equity. The tails are large, however, so that a substantial proportion of firms and banks pay a great deal to staff as a proportion of shareholder equity.

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[1]The frequency graphs are drawn from histograms of the two data sets using bins of width equal to 10% of shareholder equity. Thus, 0.15 of the sample of banks and financial institutions has remuneration less than 10% of shareholder equity, while in the general population of firms this is true of over 0.25 of the sample.

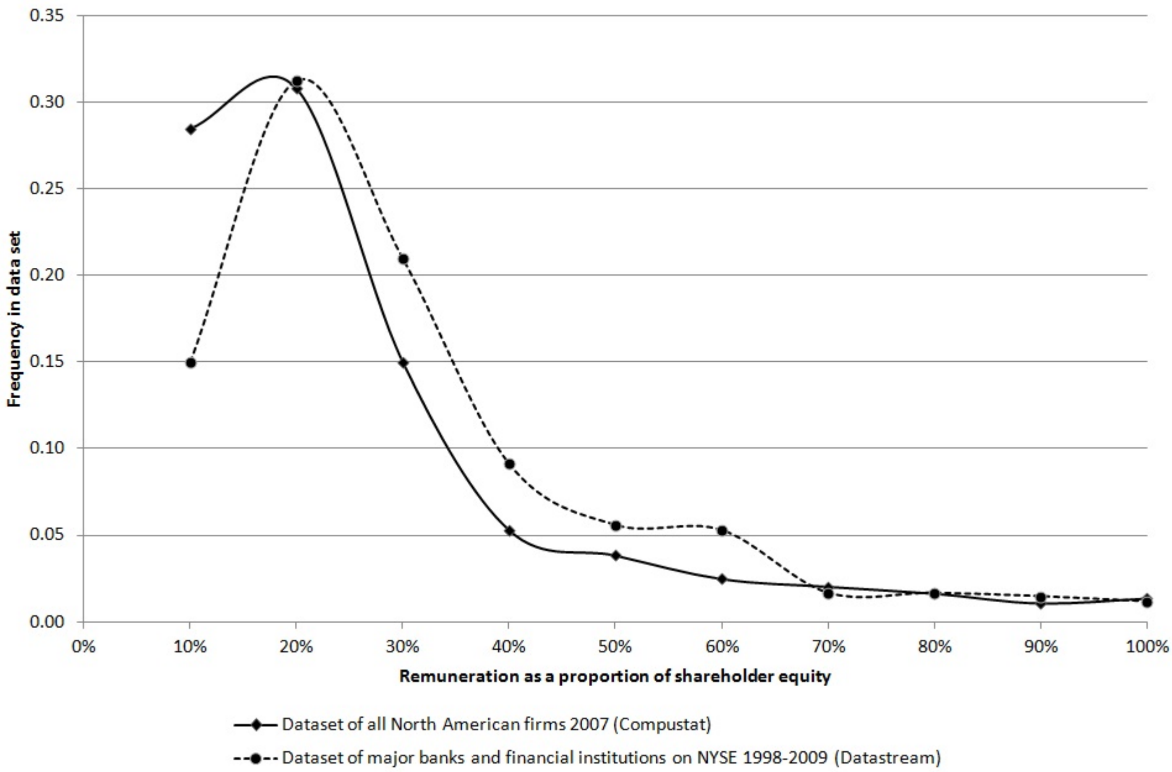

Figure IA.I: Remuneration as a proportion of shareholder equity in data set of banks and financial institutions as compared to the universe of North American firms.

The graph depicts the frequency in the data of levels of remuneration measured as a proportion of the firm's total shareholder equity. The data are constructed from a histogram of the two data sets (banks and financial institutions on the NYSE described in Section IV.D; and Compustat 2007 universe of all North American firms). The histogram uses bin width equal to 10% of shareholder equity. The graph shows that the remuneration behavior of banks and financial institutions is skewed to the right as compared to typical U.S. firms. Thus, banks typically pay more as a proportion of shareholder equity. A significant proportion of firms and banks pay very large amounts of remuneration as a proportion of shareholder equity. This raises these firms' risk of a default event. For banks this is of significant concern due to the social externalities associated with a banking default event.

II. Shareholder Equity as a Proportion Of Total Assets

The calibration of the importance of remuneration to a financial institution's default risk (Section IV.D) requires the study of typical levels of shareholder equity to total assets. Such a study is provided by Figure IA.II. This figure justifies the selection of the central estimate of shareholder equity for a bank or shadow bank as 10% of total assets.

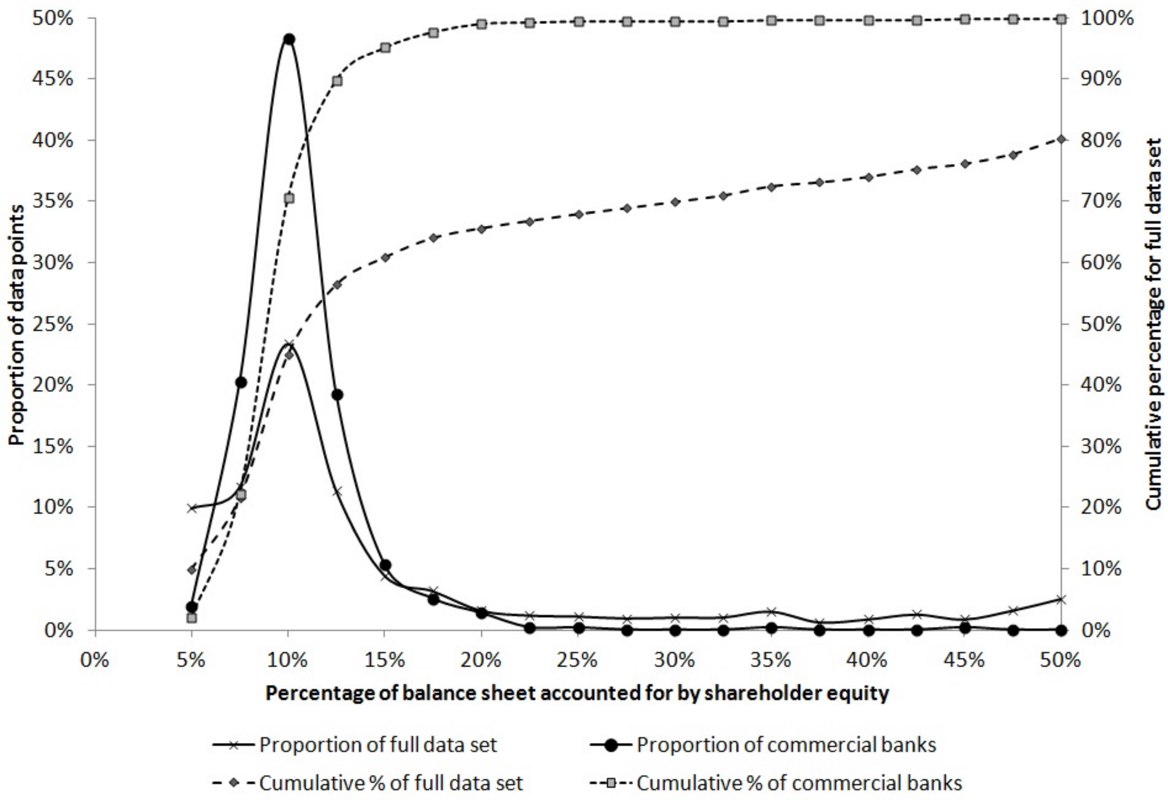

Figure IA.II: Shareholder equity as a proportion of total assets (equivalently, total balance sheet).

The graph depicts the amount of shareholder equity as a proportion of total assets held by banks and financial institutions in the sample. The distribution of shareholder equity for commercial banks is reasonably heavily concentrated around the modal value of 10%. However, for the full data set there exists a substantial tail towards higher ratios of shareholder equity to assets. For the calibration exercise I therefore use a central estimate of SHE/Assets of 10%, a low estimate of 5%, and a high estimate of 40%, which is at the 75th percentile. (Datastream data: all banks and financial institutions traded on the NYSE for which Worldscope data exist, 1998 to 2009 inclusive).

III. Calibration of Maximally Weak Bonus Caps

The maximally weak bonus caps (Definition 1) are the strictest caps on each bank that are just sufficiently generous to allow it to employ its own banking team using bonuses. The caps' purpose is to limit the extent to which a bank can bid up remuneration for its rivals' bankers. To calibrate a level for these caps it is necessary to simulate the entire model including the skill of differing teams of bankers, the risk of a default event, and the impact of a default event.

In this analysis I calibrate the maximally weak bonus caps using data just prior to the financial crisis. Any intervention in cap bonuses and in turn in bankers' pay is likely, at least initially, to focus on the largest banks as these are most readily designated as systemic institutions that have major repercussions for society should they observe a default event. I therefore turn to the set of 21 systemically important banks provided by Acharya, Gujral, and Shin (2009) and studied in Figure 1. The list of banks is provided in footnote 15 of the published text. I use Datastream data on these banks for the years 2006 and 2007, with assets, liabilities, and wages measured in U.S. dollars. The conversion to U.S. dollars is provided by Datastream. Remuneration data for Fortis Bank were incomplete and so I drop this bank from the sample, leaving 20 banks.

Balance Sheet Size, Liabilities and the Bonus Rate: Consider the 2006 accounts of the 21 banks of Acharya, Gujral, and Shin (2009). The size of their balance sheets is measured by their reported 2006 total assets; this yields $\{S_n\}$. The total liabilities in the 2006 accounts for each bank yields $\{D_n\}$. The bank rank is determined by ranking the banks using the size of their 2006 balance sheets in U.S. dollars. In 2006, using the notation of the model, bank n hires the A_n-team of bankers with a promise that they will subsequently be rewarded by remuneration $q_n a_n S_n$ at the end of the year. Here a_n is the realized return that the A_n-team generates on the balance sheet and q_n is their bonus rate. The return is recorded in the following year's accounts so $S_n^{2007} = a_n S_n^{2006}$; hence, the bonus rate q_n promised to the 2006 banking team can be inferred from 2007 data as total pay in 2007 / total assets in 2007. This yields the bonus rates $\{q_n\}$.

Calibrating Banking Teams' Investment Skill $\{\alpha_n\}$: In the absence of bonus caps, equation (A.4) applies. This equation relates the bonuses each bank awards to the skill of the banking team that is hired in equilibrium. The equation can be rewritten as

$$\alpha_n = \alpha_{n-1} \cdot \frac{S_n - S_{n-1} q_{n-1}}{(1 - q_n) S_n}. \tag{IA.I}$$

With a sample of N banks, (IA.I) yields $N-1$ separate equations in N unknowns. To solve the system I calibrate α_1 for the largest bank as being the 75^{th} percentile of the realized returns $\{a_n\}$ across all the banks ($a_n = S_n^{2007}/S_n^{2006}$). This sets $\alpha_1 = 1.30$. Such a figure for the expected performance of the best team of bankers sits comfortably with the average returns to U.S. stocks reported in Dichev (2007) of 1.14; one would expect the average returns of the best team of bankers to exceed an index of stocks. Thus, I iteratively apply (IA.I) to establish the full set of team abilities $\{\alpha_n\}$. These abilities range between 1.30 and 1.18, with the larger banks employing banking teams of higher ability.

Calibrating The Tail Of Investment Returns, G, γ: In the event of a bonus cap a bank will need to revert to using wages. However, fixed wages increase the risk that the bank faces as they are payable even if returns are low. How much a bank is willing to bid depends upon its calculation of the extra risk that it faces by increasing its fixed wage commitment. This analysis requires us to calibrate the returns distribution via the parameters G and γ. To this end, consider a banking team whose expected return matches that on U.S. stocks, namely, normally distributed with a mean $\mu = 1.14$ and standard deviation $\sigma = 0.17$, truncated at zero (Dichev (2007)). Denote the distribution of this return $F(v)$. The left tail of this distribution is approximated in this analysis by $F(v) = G(v/\mu)^{\gamma}$, where G and γ are constants to be determined. I seek to approximate this returns distribution on the entire below-average range of $v \in [0, \mu]$. As $F(\mu) = 1/2$, this implies that $G = 1/2$. To determine estimates for the index γ that apply to the lower half of the returns distribution, I rewrite the expression for γ as

$$\ln(F(v)) - \ln G = \gamma \cdot [\ln(v) - \ln \mu].$$

Running v from 0.05 to 1.14, I generate data from the normal distribution $F(v)$ that allow me to estimate γ using a simple OLS regression. This generates $\gamma = 6.5$. If I restrict attention to data generated by $v \in [0.5, 1.14]$, then $\gamma = 9.8$. As a central estimate I take the midpoint of $\gamma = 8.2$; however I work with all three distributions. The normal distribution $F(v)$ and its three approximations used in this calibration are presented in Figure IA.III. Finally, if a default event is triggered by an investment of $\$y$ going bad, then I assume that the bank faces costs of half of its initial investment of $\$y$ in managing the fallout. Thus, $\lambda = 0.5$.

Maximally Weak Bonus Calculation: The calibration considers regulatory intervention into the bonus practices of the institutions given by Acharya, Gujral, and Shin (2009). Of these data is incomplete for one (Fortis Bank), leaving 20. The maximally weak bonus calculation assumes no intervention in other banks. Thus the surplus that the bank ranked 20^{th} needs to supply is fixed by the data at q_N $(N = 20)$. The maximally weak bonus cap on bank N is given by this figure $(Q_N = q_N)$ as any lower would oblige bank N to use wages. I now develop the iterative process that, given the maximally weak bonus cap on bank n, Q_n, allows one to determine the maximally weak bonus cap for bank $n-1$. As

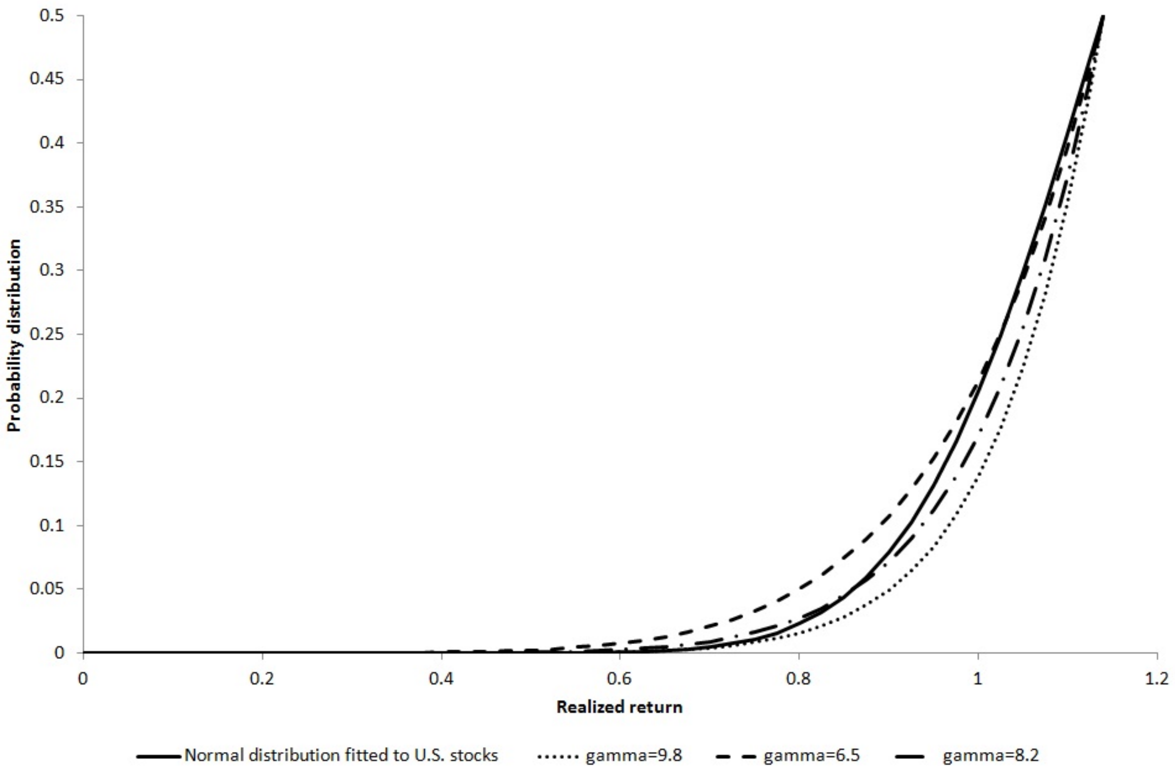

Figure IA.III: Approximations to the returns distribution for banks.
The tail of the returns distribution for banks is assumed to be normally distributed with mean $\mu = 1.14$ and standard deviation $\sigma = 0.17$ to match the returns on U.S. stocks (Dichev (2007)). This is approximated by the distribution $G(v/\mu)^\gamma$ for $v \in (0, \mu)$, where $G = 1/2$ and $\gamma \in \{6.5, 8.2, 9.8\}$. The calibrated tail distributions fit the normal distribution closely.

the ability of banking team $n-1$ is higher than that of banking team n, bank n is willing to pay more for that team. However, in bidding for the $n-1$ team the bonus cap binds. Therefore, in addition to a bonus at the level of the cap, Q_n, bank n would be willing to offer a wage to the banking team of rank $n-1$, denoted $w_{n-1,n}$. This wage can be deduced from equation (A.6) as the solution to

$$0 = (\alpha_{n-1} - \alpha_n) S_n (1 - Q_n) + \frac{\lambda S_n G}{[S_n (1 - Q_n)]^\gamma} \left[\left(\frac{D_n}{\alpha_n} \right)^\gamma - \left(\frac{w_{n-1,n} + D_n}{\alpha_{n-1}} \right)^\gamma \right] - w_{n-1,n}.$$

This equation must be solved numerically to deliver $w_{n-1,n}$ for each bank. To secure the services of the A_{n-1}-team, bank $n-1$ must match the surplus offered by bank n. The surplus offered by bank n is a wage of $w_{n-1,n}$ and a bonus of Q_n applied to bank n's balance sheet. This gives the bonus that bank $n-1$ needs to pay, and therefore its maximally weak bonus cap as

$$Q_{n-1} = q_{n-1} \text{ where } \alpha_{n-1} q_{n-1} S_{n-1} = w_{n-1,n} + \alpha_{n-1} Q_n S_n.$$

Finally, the calibration of $\{\alpha_n\}$ creates a small number of cases when the calibrated ability of the A_{n-1}-team is marginally lower than that of the A_n-team $(\alpha_{n-1} \ngtr \alpha_n)$. This can arise from measurement error of the total balance sheet or if banks report assets using marginally differing valuation methods. The latter is reported as a problem within the Basel II framework. As this problem is likely to arise from measurement error in the data I do not exogenously alter the matching between banks and their employees, leaving these as they are in reality. If α_{n-1} is less than α_n, then bank n would be willing to bid a smaller bonus to the A_{n-1}-team than they would to the A_n-team. In this case the maximally weak bonus cap on n would not be a binding constraint in the bidding for the A_{n-1}-team. Hence, the bonus offered would satisfy (A.4) allowing q_{n-1}, and in turn Q_{n-1}, to be calculated directly. My approach is therefore to avoid any ad hoc tampering with the assumptions or data and manage the calibrated variables consistently within the model.

Presenting The Output: The calibration allows one to determine the set of maximally weak bonus caps $\{Q_n\}$ and compare those to the status quo bonus rates $\{q_n\}$. Such a study allows us to investigate how much room there is to lower bonuses below the status quo level in a value-enhancing way. The difference between the dollar size of the realized annual bonus pool under the maximally weak bonus cap and the status quo value is then given by $(q_n - Q_n)\, S_n^{2007}$. This is plotted for the banks in the data set in Figure 4. Figure 4 demonstrates that for this sample of large institutions the maximally weak bonus cap would shrink the annual bonus pool by up to \$4 billion annually. Under a maximally weak bonus cap each bank is able to reward its staff using bonuses – there is no need to increase any fixed wages. Hence, the default risk of each bank can be calculated before and after the intervention using equation (3). On average such an intervention reduces banks' probability of default by over 80 basis points. That is, if the default risk was P it drops to $P \times (1 - 0.0080)$. If the intervention applied to more banks than these then the impact on default risk would increase as more pressure on remuneration would be removed from the system.

REFERENCES

Acharya, Viral V., Irvind Gujral, and Hyun Song Shin, 2009, Dividends and bank capital in the financial crisis of 2007-2009, available at SSRN: http://ssrn.com/abstract=1362299.

Dichev, Ilia, 2007, What are stock investors' actual historical returns? Evidence from dollar-weighted returns, *American Economic Review* 97, 386-401.