Online Appendixes: Not for Publication

A Data

I combine data from two main sources: 1) the Compustat database for accounting reports from publicly listed US firms, 2) the Institutional Brokers Estimate System (I/B/E/S) database for analyst earnings forecasts and reported earnings for publicly listed US companies. Unless otherwise specified, data is at the firm-fiscal year level. Linking table data from the CRSP database is also required to connect the I/B/E/S and Compustat datasets, and I make use of CRSP data to compute stock returns where applicable. I also make use of the Execucomp database, complementary to Compustat, for executive compensation data.

A.1 Compustat Data

I downloaded Compustat accounting data from the US Fundamentals Annual file in the CRSP/Compustat Merged dataset available through Wharton Research Data Services (WRDS) in January 2014. Allowed linking codes between CRSP and Compustat were "LU" and "LC," and the following sample restrictions were made:

- Nonmissing total assets `at`, SIC code `sic`, book value of capital `ppent`, GAAP earnings `ib`, operating earnings before depreciation EBITDA `oibdp`, total sales `sale`, value of equity `ceq`, employment `emp`
- Positive levels of assets and book value of capital: `at, ppent` > 0
- No utilities or financial firms as classified by SIC code: `sic` not in 6000's or 4900's
- Fiscal year between 1974 and 2010, from `datadate` year
- No major mergers flag: `compst` not equal to "AB"
- Only include primary issue securities: `priusa` equal to `liid`

A.2 I/B/E/S Data

I downloaded I/B/E/S earnings forecasts and realized earnings data from WRDS in January 2014. My data construction requires files for (stock-split) adjusted detail history, unadjusted detail history, adjusted detail actuals, unadjusted detail actuals, currency headers, and identification headers. I made the following sample restrictions where applicable:

- Nonmissing I/B/E/S permanent ticker `ticker`, earnings per share (EPS) value of forecast or realization `value`, nonmissing fiscal period end date `pends` or `fpedats`, nonmissing announcement date `anndats`, nonmissing analyst and estimator codes `analys, estimator`

- Only US firms, as indicated in all files by `usfirm = 1`
- Only firms reporting in US dollars, with available primary/diluted reporting basis flag and historical CUSIP number, as indicated by the currency and identification header files by `curr, pdi, cusip`

I/B/E/S makes available forecasts for earnings per share as well as realized "Street" earnings per share on two reporting bases: "adjusted," in which the entire time series for a security is continuously adjusted for both stock splits and primary/dilution factors, as well as "unadjusted," in which the originally reported forecasts and actuals are stored. Information is also available as "summary" or "detail" data, with summary files containing consensus forecasts for a firm as well as reported actuals, rounded to 2 digits (i.e. cents of earnings per share) and detail files containing the history of analyst forecast rounded to 4 digits.

As Payne and Thomas (2003) note, the joint presence of stock splits and rounding in the adjusted summary files can lead to a severe loss of information as some earnings hits or misses are misclassified as zeros due to the ex-post adjustments made by I/B/E/S. Because accurate classification of earnings hits or misses is crucial to my research agenda, I base my analysis on the unadjusted detail files. However, this requires that all analyst forecasts from the unadjusted files be readjusted to the reporting basis as of the earnings announcement date, since reporting conventions for some securities may change in between a given analyst forecast and the earnings announcement.

To readjust analyst forecasts to the same basis as announced unadjusted actuals requires the following process:

1. Merge the adjusted detail history files with the unadjusted detail history files, on I/B/E/S variables `ticker, fpedats, anndats, analys, estimator`
2. For each unadjusted forecast i of EPS for ticker j in fiscal year t $\hat{\texttt{EPS}}^{\texttt{unadj}}_{\texttt{ijt}}$ as well as equivalent adjusted forecast $\hat{\texttt{EPS}}^{\texttt{adj}}_{\texttt{ijt}}$, compute the stock split ratio of forecast i relative to the data download date
$$\texttt{ratio}^{\texttt{i,today}}_{\texttt{ijt}} = \frac{\hat{\texttt{EPS}}^{\texttt{unadj}}_{\texttt{ijt}}}{\hat{\texttt{EPS}}^{\texttt{adj}}_{\texttt{ijt}}}$$
3. For each unadjusted actual value of EPS for ticker j in fiscal year t $\texttt{EPS}^{\texttt{unadj}}_{\texttt{jt}}$, as well as equivalent adjusted actual $\texttt{EPS}^{\texttt{adj}}_{\texttt{jt}}$, compute the stock split ratio of the realized earnings in t relative to the data download date
$$\texttt{ratio}^{\texttt{t,today}}_{\texttt{jt}} = \frac{\texttt{EPS}^{\texttt{unadj}}_{\texttt{jt}}}{\texttt{EPS}^{\texttt{adj}}_{\texttt{jt}}}$$
4. Based on the two ratios above, compute for each unadjusted forecast i of EPS for ticker j in fiscal year t, the EPS forecast $\tilde{\texttt{EPS}}_{\texttt{ijt}}$ on the same reporting basis

as t

$$\tilde{\mathtt{EPS}}_{\mathtt{ijt}} = \hat{\mathtt{EPS}}^{\mathtt{unadj}}_{\mathtt{ijt}} \frac{\mathtt{ratio}^{\mathtt{t,today}}_{\mathtt{jt}}}{\mathtt{ratio}^{\mathtt{i,today}}_{\mathtt{ijt}}}$$

Since they are on the same reporting basis, the analyst forecasts $\tilde{\mathtt{EPS}}_{\mathtt{ijt}}$, which have 4-digit precision, can be directly compared to the unadjusted actuals series $\mathtt{EPS}^{\mathtt{unadj}}_{\mathtt{jt}}$. All forecast statistics are computed from these underlying series.

Note that forecasts are made throughout the fiscal year for a given end of year financial release. Therefore, I must make a choice of horizon at which to compute earnings forecasts. In the baseline analysis, I consider forecasts made from a two-quarter horizon, i.e. from 91 to 180 days before the data release. Given a horizon, I construct, for a given firm and fiscal year combination (`ticker` and `pends` in I/B/E/S), a dataset with realized Street actuals as well as median analyst forecasts of earnings per share within that horizon window $[d_1, d_2]$. More precisely, my forecast for a particular firm-fiscal year of earnings per share with horizon window $[d_1, d_2]$ equals

$$\mathtt{EPS}^{\mathtt{f}}_{\mathtt{jt}} = \mathtt{median}\{\tilde{\mathtt{EPS}}_{\mathtt{ijs}} | \mathtt{t} - \mathtt{s} \in [\mathtt{d}_1, \mathtt{d}_2]\}.$$

A.3 Linking Compustat and I/B/E/S

Linking the Compustat and I/B/E/S data requires all observations from the underlying Compustat data, which are uniquely identified by a combination of permanent security identifier `gvkey` and `datadate`, with I/B/E/S observations of realized EPS and forecast EPS, which are uniquely identified by the permanent ticker `ticker` and forecast period end date variables `pends` and `fpedats`. Following the WRDS recommendation for linking in Moussawi (2006), these sets of identifiers can be linked through the CRSP dataset as follows.

- Download the CRSP linking information with the permanent CRSP identifier `permno` together with historical CUSIP security identifiers `cusip` and first date of use `date`
- For each observation in the Compustat dataset which, as a member of the Compustat/CRSP merged database already contains the CRSP identifying PERMNO value, use the date range in the CRSP linking table to assign an historical CUSIP value
- Match a Compustat accounting observation to an I/B/E/S forecast information and realized earnings observation if they have identical CUSIP, PERMNO, as well as fiscal year end date (defined by year and month)

A.4 Execucomp Data

Data from Execucomp from fiscal years 1992-2010 is integrated with the Compustat panel using the common firm identifier `gvkey` together with the date variable

Table A.1: Descriptive statistics

	Mean	Median	Standard Deviation
Assets	4007.7	599.7	15977.9
Revenues	3505.3	610.5	11804.5
Employment	15.5	3.3	50.8
Intangibles	730.7	136.7	2301.4
R&D	135.0	14.9	519.9
Street Earnings	245.7	32.9	940.2

Note: Assets, Revenues, Intangibles, R&D, and Street Earnings in millions of dollars. Employment in thousands. Intangibles represents selling, general, and administrative expenditures. R&D represents total research and development expenditures. Statistics computed from the forecast error discontinuity detection sample in the year 2000, covering 920 firms and 217 4-digit SIC industries.

`datadate`. CEO compensation and compensation for other executives are considered, with observations requiring `pceo` equal to "CEO" for the CEO subsample. Total compensation for a given fiscal year is measured as the log total pay `tdc2` from Execucomp.

A.5 CRSP Data

Stock returns data from the Center for Research in Security Prices (CRSP) from fiscal years 1983-2010 is integrated with the Compustat panel using the common firm identifier `permno`. Abnormal returns are equal to the cumulative abnormal return over a ten-day window up to the earnings release date for a particular firm fiscal year, market-adjusting daily returns using the S&P 500 index return and within-firm regressions.

Note that in the discontinuity detection exercises, I wish to focus on behavior near the earnings forecast targets and to remove the influence of observations with an unusually high number of analyst forecast records and potentially dramatic changes in firm news between forecast generation and earnings releases. Therefore, before estimating the regression discontinuities reported in the main text I further restrict the sample to remove observations with forecast errors greater than than 1% of firm assets in absolute value or with higher than the 99.5 percentile of forecast frequency in the aggregation period. Table A.1 reports descriptive statistics on the resulting sample for estimation of the investment regression discontinuities in Section 1 of the paper. Table A.2 reports placebo checks for each of the regression discontinuity estimates reported in Section 1. Table A.3 reports block bootstrap estimates of the regression discontinuities from Section 1.

Note that the production of the cross-sectional industry correlations in bunching reported in Figure 3 requires the calculation of R&D intensity, analyst coverage, analyst forecast disagreement, and the panel sensitivity of R&D growth to sales growth. To ensure sufficient data for reliable panel estimation of the R&D sensitivity measure,

Table A.2: Regression discontinuity placebo checks

Variable	-0.15% Cutpoint	0.15% Cutpoint
Investment Rate	-0.44	0.44
	(0.37)	(0.40)
Intangibles Growth	0.26	-0.55
	(0.55)	(0.53)
R&D Growth	0.81	-0.88
	(1.00)	(0.93)
CEO Pay	-3.89	0.39
	(3.29)	(3.66)
Executive Pay	-3.86	0.61
	(2.38)	(2.67)
Abnormal Returns	-0.28	-0.20
	(0.26)	(0.22)

Note: The regression discontinuity estimation relies on local linear regressions and a triangular kernel, with bandwidth chosen via the optimal Imbens and Kalyanaraman (2011) approach. Standard errors are clustered at the firm level. The estimates represent the mean predicted differences for firms just meeting earnings forecast cutpoints relative to firms just failing to meet forecast cutpoints, for placebo checks at -0.15% and 0.15% forecast errors. Earnings forecast errors are Street earnings minus median analyst forecasts from a 2-quarter horizon, scaled by firm assets as a percentage. Investment Rate is the percentage tangible annual investment rate. Intangibles growth is annual percent selling, general, and administrative expenditures growth. R&D growth is annual percent research and development expenditure growth. CEO Pay, Executive Pay are the log of total pay for the CEO and several most highly compensated executives at a firm, respectively. Abnormal Returns are the cumulative abnormal returns for a firm in a ten-day window to the announcement date, market adjusting using the returns of the S&P 500. For returns analyst forecasts are drawn from a 1-quarter horizon.

I restrict consideration to 4-digit SIC industry cells within the baseline discontinuity estimation sample that consist of greater than or equal to 250 firm-year observations.

A.6 Data Moments and Model Estimation

To compute model moments, I first require positive values of Compustat sales `sale` and selling, general, and administrative (SG&A) expenses `xsga`. Then, I also deflate sales, SG&A, and research and development expenditures `xrd` by the value of the GDP deflator current as of December 2013.[54] Given real values for a series x_t, I compute percentage growth rates as

$$\Delta x_t = \begin{cases} 2\frac{x_t - x_{t-1}}{x_t + x_{t+1}}, & x_t \neq 0 \text{ or } x_{t-1} \neq 0 \\ 0, & x_t = x_{t-1} = 0 \end{cases} .$$

This measure of growth rates as the difference relative to the average follows Davis and Haltiwanger (1992) and has the advantage of being bounded within $[-2, 2]$. Selection out of R&D with zero spending for a particular year results in a bounded rather than missing growth value. Following the construction of growth rates and real series from Compustat data, I use the linking process described above to I/B/E/S to obtain a dataset with merged accounting (from Compustat) and earnings forecast (from I/B/E/S) data.

After the link, unscaled values of Street earnings ($\texttt{Street}_{\texttt{jt}}$) and forecasts ($\texttt{Street}^{\texttt{f}}_{\texttt{t}}$) can be computed by multiplying either the primary or diluted share count as of the fiscal year end date from Compustat (`cshpri` or `cshfd`, respectively, with choice determined by I/B/E/S dilution flag `pdi`) by the unadjusted earnings per share actual value ($\texttt{EPS}^{\texttt{unadj}}_{\texttt{jt}}$) or forecast value ($\texttt{EPS}^{\texttt{f}}_{\texttt{jt}}$) from I/B/E/S. Once unscaled forecasts and actual Street earnings values exist, the forecast error is defined as actual Street earnings minus forecast earnings: $\texttt{fe}_{\texttt{jt}} = \texttt{Street}_{\texttt{jt}} - \texttt{Street}^{\texttt{f}}_{\texttt{jt}}$.[55] For correspondence with model moments, I compute forecast errors defined as

$$\hat{fe}_{jt} = \begin{cases} 2\frac{\texttt{fe}_{\texttt{jt}}}{|\texttt{Street}_{\texttt{jt}}| + |\texttt{Street}^{\texttt{f}}_{\texttt{jt}}|}, & |Street_{jt}| \neq 0 \text{ or } |Street^f_{jt}| \neq 0 \\ 0, & |Street_{jt}| = |Street^f_{jt}| \neq 0 \end{cases} .$$

This measure of forecast error relative to the average absolute value of actual and forecasted Street earnings has several advantages. First, $\hat{fe}_{jt}$ is bounded in $[-2, 2]$ and can flexibly accommodate zeros in forecast or actual earnings series together with differences in sign. I construct estimation moments from data which includes the following series: sales growth, R&D growth, and percentage forecast errors. To avoid the influence of outliers, I further remove observations more extreme than the 0.5% or 99.5% quantiles for accounting series and observations exactly equal to -2 or 2 for percentage forecast error. As noted in the main text, I consider a total of six

[54] The GDP deflator is given by the series `GDPDEF` in the Federal Reserve Bank of St. Louis' online FRED database, accessed at `http://research.stlouisfed.org/fred2/`.

[55] I omit the dependence of forecast errors on horizon, although as noted in the I/B/E/S data subsection, earnings per share forecasts are defined as median analyst expectations within a given horizon window before the data release date.

micro moments for estimation. The values of the moment covariance matrix, in raw form as utilized in the GMM estimation procedure itself, are reported in Table A.4.

I now turn to the details of the overidentified GMM structural estimation of $\hat{\theta}$ in the baseline model based on the vector of moments $m(X)$. Recall that the aggregate growth rate is used as a targeted moment in the estimation, together with the micro-level covariance matrix of sales growth, R&D growth, and forecast errors. The growth rate is the average annual growth rate of US per capita GDP from 1961-2010, FRED series `USARGDPC`.

Under an assumption of independence between micro and macro data samples, the covariance matrix of the joint set of moments $m(X)$ is computed in a two-stage process. First, I compute the variance of the aggregate growth rate g, $\hat{\sigma}_g^2$, taking into account arbitrary stationary time series correlation in my sample of length T using the stationary bootstrap of Politis and Romano (1994).

Table A.3: Bootstrap estimates of local discontinuities in forecast errors

	(1)	(2)	(3)	(4)	(5)	(6)
Method	Local Linear	Local Linear	Local Linear	Local Linear	Local Linear	Local Linear
Dependent Variable	Investment Rate	Intangibles Growth	R&D Growth	CEO Pay	Executive Pay	Abnormal Returns
Running Variable	Forecast Error	Forecast Error	Forecast Error	Forecast Error	Forecast Error	Forecast Error
Cutpoint	0	0	0	0	0	0
Discontinuity	0.40	-2.67***	-2.63*	6.89***	4.89***	0.67***
	(0.39)	(0.92)	(1.56)	(2.59)	(1.73)	(0.21)
Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Market-Adjusted
Years	1983-2010	1983-2010	1983-2010	1992-2010	1992-2010	1983-2010
Firms	3969	3969	3969	2349	2382	7794
Observations	23084	23084	23084	17661	114296	48297
Relative to Mean	1.0%	-27.2%	-33.7%	6.89%[a]	4.89%[a]	0.67%[a]

Note: *,**,*** denote 10, 5, 1% significance. The results reflect a block bootstrap procedure. Draws of data blocks were sampled with replacement from the distribution of firms, taking into account within-firm correlation as well as uncertainty surrounding variable demeaning by firm and year and the estimation of the regression discontinuity itself. The point estimates are the mean, and the standard errors are the standard deviation, over 250 bootstrap replications. The regression discontinuity estimation relies on local linear regressions and a triangular kernel, with bandwidth chosen via the optimal Imbens and Kalyanaraman (2011) approach. The estimates represent the mean predicted differences for firms just meeting earnings forecasts relative to firms just missing. Forecast errors are Street earnings minus median analyst forecasts from a 2-quarter horizon, scaled by firm assets as a percentage. Investment Rate is the percentage tangible annual investment rate. Intangibles growth is annual percent selling, general, and administrative expenditures growth. R&D growth is annual percent research and development expenditures growth. CEO Pay, Executive Pay are the log of total pay for the CEO and several most highly compensated executives at a firm, respectively. Abnormal Returns are the cumulative abnormal returns for a firm in a ten-day window to the announcement date, market adjusting using the returns of the S&P 500. For returns analyst forecasts are drawn from a 1-quarter horizon.

[a] Executive pay and stock returns are already in normalized form, and these values duplicate discontinuity estimates.

Table A.4: Covariance matrix of sales growth, R&D growth, forecast Errors

	$\Delta Sales$	$\Delta R\&D$	% Forecast Error
$\Delta Sales$	0.067040655	0.027758656	0.008499934
$\Delta R\&D$	0.027758656	0.09078609	-0.00009675512
% Forecast Error	0.008499934	-0.00009675512	0.1328048

Note: The moments sample is as described in the text above, with 32,597 firm-fiscal year observations in an unbalanced panel with Davis and Haltiwanger (1992) growth rate and forecast error transformations applied to real sales, real R&D expenditures, and Street forecast error series in a merged Compustat and I/B/E/S dataset from 1982-2010.

Second, note that the vector of micro moments can be written as a smooth function of unscaled first and second moments, say $\hat{\mu}$, of sales growth, R&D growth, and forecast errors, so that the estimated covariance matrix of the micro moments, $\hat{\tilde{V}}$, is immediately implied by an estimate of the covariance matrix of the raw moments, Ω, and the Delta method. I compute $\hat{\Omega}$ with asymptotics in the number of firms N allowing for arbitrary clustering within firms. If each firm j has T_j observations in the sample and the average number of observations is $\hat{\tau} = \frac{\sum_{j=1}^{N} T_j}{N}$, then in particular

$$\hat{\mu} = \frac{1}{N}\sum_{j=1}^{N}\frac{1}{\hat{\tau}}\sum_{t=1}^{T_j} x_{jt}$$

$$\hat{\Omega} = \frac{1}{N}\frac{1}{\hat{\tau}^2}\sum_{j=1}^{N}\sum_{s=1}^{T_j}\sum_{t=1}^{T_j}(x_{js} - \hat{\mu})(x_{jt} - \hat{\mu})'$$

$$\sqrt{N}\,(\hat{\mu} - \mu) \to_d N(0, \Omega),$$

where x_{jt} is the stacked vector of levels and cross-products of R&D growth, sales growth, and forecast errors for firm j in period t.

Under an assumption that $\hat{\gamma} = \sqrt{\frac{T}{N}} \to \gamma$ asymptotically as $N \to \infty$, which adjusts for relative sample sizes, together with the assumption of independence between the micro and macro samples, I can write the joint asymptotic covariance matrix of the vector $m(X)$ of the aggregate growth rate and micro moments together as

$$\begin{bmatrix} \hat{\gamma} & 0 \\ 0 & 1 \end{bmatrix} \sqrt{N}\,(m(X) - m(\theta)) \to_d N(0, V),$$

where $\hat{V} = \begin{bmatrix} \hat{\sigma}_g^2 & 0 \\ 0 & \hat{\tilde{V}} \end{bmatrix}$.

Given the asymptotic distribution of the moments used in the estimation of the underlying structural parameters θ, the definition of $\hat{\theta}$ as the minimizer of the GMM objective function and standard GMM arguments yield the result that

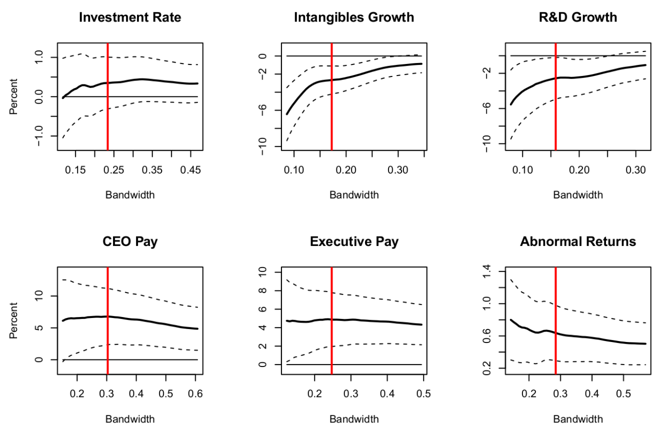

Figure A.1: Discontinuity estimates for alternative bandwidths

Note: Standard errors are clustered at the firm level. The baseline regression discontinuity estimation relies on local linear regressions and a triangular kernel, with bandwidth chosen via the optimal Imbens and Kalyanaraman (2011) approach. The figures above plot, for each outcome variable, regression discontinuity estimates and 90% confidence intervals for a range from one half to twice the optimal bandwidth amount. The optimal bandwidth choice is indicated by red vertical lines. The estimates represent the mean predicted differences for firms just meeting earnings forecasts relative to firms just missing. Forecast errors are Street earnings minus median analyst forecasts from a 2-quarter horizon, scaled by firm assets as a percentage. Investment Rate is the percentage tangible annual investment rate. Intangibles growth is annual percent selling, general, and administrative expenditures growth. R&D growth is annual percent research and development expenditure growth. CEO Pay, Executive Pay are the log of total pay for the CEO and several most highly compensated executives at a firm, respectively. Abnormal Returns are the cumulative abnormal returns for a firm in a ten-day window to the announcement date, market adjusting using the returns of the S&P 500. For returns analyst forecasts are drawn from a 1-quarter horizon.

$$\sqrt{N}(\hat{\theta} - \theta) \to_d N(0, \Sigma),$$

where the covariance matrix of the estimated parameters is given by

$$\Sigma = \left[\frac{\partial m(\theta)}{\partial \theta'} W \frac{\partial m(\theta)}{\partial \theta}\right]^{-1} \frac{\partial m(\theta)}{\partial \theta'} W \begin{bmatrix} \frac{1}{\gamma} & 0 \\ 0 & 1 \end{bmatrix} V \begin{bmatrix} \frac{1}{\gamma} & 0 \\ 0 & 1 \end{bmatrix} W \frac{\partial m(\theta)}{\partial \theta} \left[\frac{\partial m(\theta)}{\partial \theta'} W \frac{\partial m(\theta)}{\partial \theta}\right]^{-1}.$$

Here, the weighting matrix W is chosen so that the GMM objective is equal to the sum of the squared percentage deviations of model from data moments, with one modification. The aggregate growth rate, of crucial importance economically given my growth framework, is assigned 10 times more weight than the micro moments. Estimates of $\hat{\theta}$ are computed using particle swarm optimization, a robust and standard global stochastic optimization routine. Given $\hat{\theta}$ and W, an estimate of the Jacobian $\frac{\partial m(\theta)}{\partial \theta'}$ of model moments with respect to parameters is computed using straightforward numerical differentiation averaging over relative step sizes of 0.75%, 1%, and 1.25%.

B Theory

B.1 Model Equilibrium

An equilibrium consists of household consumption and savings policies C_t, B_{t+1}, $\{S_{jt}\}_j$, final goods firm input policies $\{X_{jt}\}_j$, L_t^D, intermediate goods firm manager R&D, pricing, paper manipulation, shirking, and franchise pricing policies $\{z_{jt}, p_{jt}, m_{jt}, s_{jt}, \chi_{jt}^M\}_j$, intermediate goods firm manager rejection policies $\{r_{jt}\}_j$, analyst forecasts $\{\pi_{jt}^f\}_j$, aggregate final output Y_t, aggregate intermediate goods expenditures X_t, aggregate accounting manipulation expenditures AC_t, aggregate R&D expenditures Z_t, aggregate firm miss costs Ξ_t^{firm}, and lump-sum transfers T_t^{HH}, T_t^M, together with prices R_{t+1}, $\{P_{jt}\}$, and w_t such that the following conditions hold.

Household Optimizes

Taking as given wages w_t, share prices and dividends $\{P_{jt}\}_j$, $\{D_{jt}\}_j$, and lump-sum transfers T_t^{HH}, the values for household consumption C_t, one-period risk free bond savings B_{t+1}, and share purchases in intermediate goods firms $\{S_{jt}\}$ maximize household utility:

$$\max_{C_t, B_{t+1}, \{S_{jt}\}} \sum_{t=0}^{\infty} \rho^t \frac{C_t^{1-\sigma}}{1-\sigma}$$

$$C_t + B_{t+1} + \int_0^1 P_{jt} S_{jt} dj = R_t B_t + w_t L + \int_0^1 (P_{jt} + D_{jt}) S_{jt-1} dj + T_t^{HH}.$$

Final Goods Sector Optimizes

Taking as given wages w_t and intermediate input prices p_{jt}, the competitive and constant returns to scale final goods sector labor and intermediate input demands L_t^D, $\{X_{jt}\}_j$ maximize profits:

$$\max_{\{X_{jt}\}, L_t^D} Y_t - \int_0^1 p_{jt} X_{jt} dj - w_t L_t^D$$

$$Y_t = \frac{(L_t^D)^\beta}{(1-\beta)} \int_0^1 \left[Q_{jt}(a_{jt} + \varepsilon_{jt})(1 - \gamma_s s_{jt})\right]^\beta X_{jt}^{1-\beta} dj.$$

Managers Optimize

Taking as given an exogenous endowment of consumption goods $\bar{C}^M Q_t$, exogenous persistent and transitory profitability shocks a_{jt-1}, ε_{jt-1}, long-term quality level Q_{jt-1}, previous manager R&D and paper manipulation choices z_{jt-1}, m_{jt-1}, next-period earnings forecasts Π_{jt}^f, and the previous manager's take-it-or-leave it price χ_{jt-1}^M for the managerial franchise, each manager $j \in [0,1]$ born in period $t-1$ must make the end of period $t-1$ choice $r_{jt-1} \in \{0,1\}$ to reject ($r_{jt-1} = 1$) or accept ($r_{jt-1} = 0$) the offer of the managerial franchise when seeking to maximize period t expected utility, i.e.

$$r_{jt-1} = \arg\max_r -R_t \chi_{jt-1}^M (1-r) + \bar{C}^M Q_t + T_t^M + (1-r)\mathbb{E}_{t-1} \begin{pmatrix} \theta_d D_{jt} - \xi \mathbb{I}(\Pi_{jt} < \Pi_{jt}^f) Q_{jt} \\ +\lambda_e Q_{jt} + \lambda_s s_{jt} Q_{jt} + \chi_{jt}^M (1 - r_{jt}) \end{pmatrix}.$$

Conditional upon accepting the previous manager's franchise offer ($r_{jt-1} = 0$), in their second period of life in period t each manager $j \in [0, 1]$ born in period $t - 1$ must make R&D investment, paper manipulation, monopoly pricing, and managerial franchise pricing offer choices z_{jt}, m_{jt}, p_{jt}, and χ^M_{jt}. These decisions take as given the realization of exogenous persistent and transitory profitability shock a_{jt}, ε_{jt}, long-term quality Q_{jt}, current profit forecast Π^f_{jt}, as well as the optimal choice r_{jt} of acceptance or rejection of the managerial franchise by the next-period manager born in period t. The manager seeks to maximize their period t utility, i.e. they solve the problem

$$\max_{z_{jt}, m_{jt}, p_{jt}, s_{jt}, \chi^M_{jt}} \left(\begin{array}{c} -R_t \chi^M_{jt-1} + \bar{C}^M Q_t + T^M_t + \theta_d D_{jt} - \xi \mathbb{I}(\Pi_{jt} < \Pi^f_{jt}) Q_{jt} \\ +\lambda_e Q_{jt} + \lambda_s s_{jt} Q_{jt} + \chi^M_{jt}(1 - r_{jt}) \end{array} \right).$$

From the perspective of the manager, perceived miss costs are a combination $\xi = \xi^{manager} + \theta_d \xi^{firm} + (1 - \theta_d)\xi^{pay}$, and dividends net of manager clawback compensation and firm-borne miss costs are $D_{jt} = (1 - \tau_c)\left(\Pi_v(Q_{jt}, a_{jt}, \varepsilon_{jt}, p_{jt})(1 - \gamma_s s_{jt}) - z_{jt} Q_{jt}\right) - \gamma_m m^2_{jt} Q_{jt}$.

Intermediate Goods Firm Values

Given exogenous persistent and transitory profitability shocks a_{jt}, ε_{jt}, long-term quality level Q_{jt}, and analyst forecasts Π^f_{jt}, as well as manager-determined intermediate goods firm R&D investments z_{jt}, monopoly prices p_{jt}, shirking decisions s_{jt}, and accounting manipulation choices m_{jt}, the value of intermediate goods firms j at time t is given by the present-discounted value of firm dividends

$$\mathbb{E} \sum_{t=0}^{\infty} \left(\frac{1}{R} \right)^t \left(\begin{array}{c} (1 - \tau_c)\left(\Pi_v(Q_{jt}, a_{jt}, \varepsilon_{jt}, p_{jt})(1 - \gamma_s s_{jt}) - z_{jt} Q_{jt}\right) \\ -\gamma_m m^2_{jt} Q_{jt} - (\xi^{firm} - \xi^{pay}) \mathbb{I}(\Pi^{Street}_{jt} < \Pi^f_{jt}) Q_{jt} \end{array} \right),$$

$$\Pi^{Street}_{jt} = (1 - \tau_c)\left(\Pi_v(Q_{jt}, a_{jt}, \varepsilon_{jt}, p_{jt})(1 - \gamma_s s_{jt}) - z_{jt} Q_{jt}\right) + m_{jt} Q_{jt}$$

$$Q_{jt+1} = \left\{ \begin{array}{ll} \lambda Q_{jt}, & \text{with probability } \Phi(z_{jt}) \\ \max(Q_{jt}, \omega Q_{t+1}), & \text{with probability } 1 - \Phi(z_{jt}) \end{array} \right., \quad \Phi(z_{jt}) = A z^{\alpha}_{jt}$$

$$a_{jt} = (1 - \rho_a) + \rho_a a_{jt-1} + \zeta_{jt}, \quad \zeta_{jt} \sim N(0, \sigma^2_a), \quad \varepsilon_{jt} \sim N(0, \sigma^2_\varepsilon)$$

$$\Pi_v(Q_{jt}, a_{jt}, \varepsilon_{jt}, p_{jt}) = p_{jt} X_{jt} - \psi X_{jt}, \psi = 1 - \beta.$$

Analyst Sector Optimizes

Taking as given normalized Street earnings last period $\pi_{jt-1} = \frac{\Pi^{Street}_{jt-1}}{Q_{jt-1}}$, an outside analyst sector forecasts normalized Street earnings π_{jt} today, where the forecast earnings levels $\pi^f_{jt} = \frac{\Pi^f_{jt}}{Q_{jt}}$ must minimize analyst loss as follows

$$\pi^f_{jt} = \arg\min_{\pi^f} \mathbb{E}_{\pi_{jt-1}} (\pi^f - \pi_{jt})^2.$$

Labor and Asset Markets Clear

$$L^D_t = L \text{ (Final Goods Labor Input)}$$

$$B_{t+1} = \int \chi_{jt}^{M}(1 - r_{jt-1})dj \text{ (Borrowing for Franchise Purchases Only)}$$

$$S_{jt} = 1 - \theta_d \text{ (Equity Share Market)}$$

$$r_{jt} = 0 \text{ (Managerial Franchise Market)}$$

Government Budget Balances

$$T_t^{HH} + T_t^{M} = \int \tau_c \left(\Pi_{vjt}(1 - \gamma_s s_{jt}) - z_{jt} Q_{jt}\right) dj$$

Managers Consume Their Endowments

$$C_t^M = \int C_{jt}^M dj = \bar{C}^M Q_t$$

Resource Constraint and Aggregation Conditions are Satisfied

$$Y_t + \bar{C}^M Q_t = C_t + C_t^M + X_t + \Xi_t^{firm} + Z_t + AC_t \text{ (Goods Market Clearing)}$$

$$X_t = \int \psi X_{jt} dj \text{ (Intermediate Consumption)}$$

$$Z_t = \int z_{jt} Q_{jt} dj \text{ (R\&D Investment)}$$

$$\Xi_t^{Firm} = \int \xi^{firm} \mathbb{I}(\Pi_{jt}^{Street} < \Pi_{jt}^{f}) Q_{jt} dj \text{ (Firm Earnings Costs)}$$

$$AC_t = \int AC_m(m_{jt}) Q_{jt} dj \text{ (Accounting Manipulation Costs)}$$

B.2 Normalization and Recursive Firm Problem

Consider a stationary balanced growth bath equilibrium where average quality in the economy $Q_t = \int Q_{jt} dj$ grows at a constant rate g and there exists an invariant distribution $\mu(a_{jt}, \varepsilon_{jt}, q_{jt}, \pi_{jt}^f)$ of intermediate goods firm manager state variables with $q_{jt} = \frac{Q_{jt}}{Q_t}$ and π_{jt}^f defined above. Then, immediately, all of the aggregates in the economy grow at the rate g as well, since

$$X_t = \int \psi X_{jt} dj = Q_t \int \psi L(a_{jt} + \varepsilon_{jt})(1 - \gamma_s s_{jt}) q_{jt} d\mu \propto Q_t$$

$$Z_t = \int z_{jt} Q_{jt} dj = Q_t \int z_{jt} q_{jt} d\mu \propto Q_t$$

$$\Xi_t^{firm} = \int \xi^{firm} \mathbb{I}(\Pi_{jt}^{Street} < \Pi_{jt}^{f}) Q_{jt} dj = Q_t \int \xi^{firm} \mathbb{I}(\pi_{jt} < \pi_{jt}^{f}) q_{jt} d\mu \propto Q_t$$

$$AC_t = \int \gamma_m m_{jt}^2 Q_{jt} dj = Q_t \int \gamma_m m_{jt}^2 q_{jt} dj \propto Q_t$$

$$Y_t = \frac{L^\beta}{(1-\beta)} \int_0^1 \left[Q_{jt}(a_{jt}+\varepsilon_{jt})(1-\gamma_s s_{jt})\right]^\beta X_{jt}^{1-\beta} dj = \frac{L}{1-\beta} Q_t \int q_{jt}(a_{jt}+\varepsilon_{jt})(1-\gamma_s s_{jt}) d\mu \propto Q_t$$

$$C_t = Y_t - X_t - Z_t - AC_t - \Xi_t^{firm} \propto Q_t.$$

Therefore, the household intertemporal Euler equation for savings in one-period bonds yields the standard result of a constant interest rate $R_{t+1} = \frac{1}{\rho}(1+g)^\sigma = R$. Note, as will be shown below, that manager value maximization solves

$$\max_{z_{jt}, m_{jt}, s_{jt}} \mathbb{E}_0 \left\{ \sum_{t=0}^{\infty} \left(\frac{1}{R}\right)^t D_{jt}^M \right\}$$

$$= \max_{z_{jt}, m_{jt}, s_{jt}} \mathbb{E}_0 \left\{ \sum_{t=0}^{\infty} \left(\frac{1}{R}\right)^t Q_t \frac{D_{jt}^M}{Q_t} \right\} \leftrightarrow \max_{z_{jt}, m_{jt}, s_{jt}} \mathbb{E}_0 \left\{ \sum_{t=0}^{\infty} \left(\frac{1+g}{R}\right)^t \frac{D_{jt}^M}{Q_t} \right\}.$$

The above trivially omits the monopoly pricing decision $p_{jt} = 1$ from the firm problem. Also, if $\sigma \geq 1$ then $\frac{1+g}{R} = \rho(1+g)^{1-\sigma} \leq \rho < 1$. D_{jt}^M, the manager flow return written in full in the equilibrium above, is homogenous in Q_{jt} and hence stationary since $q_{jt} = \frac{Q_{jt}}{Q_t}$ is stationary. Therefore, the intermediate goods firm manager's objective exists in stationary, normalized form.

Manager policies can be obtained as the result of maximization of manager flow returns discounted by the market interest rate, the objective written and analyzed above. To justify this, first note that manager j born in time $t-1$ will accept the offer of a managerial franchise (i.e. set $r_{jt-1} = 0$) for the following period t at price χ_{jt-1}^M if and only if

$$R_t \chi_{jt-1}^M \leq \mathbb{E}_{t-1} \left(\begin{array}{c} \theta_d D_{jt} - \xi \mathbb{I}(\Pi_{jt}^{Street} < \Pi_{jt}^f) Q_{jt} \\ +\lambda_e Q_{jt} + \chi_{jt}^M \end{array} \right).$$

Via backward induction, since χ_{jt-1}^M is a take-it-or-leave it price from the previous manager and since the previous manager's utility is strictly increasing in χ_{jt}^M, it must always be the case that market clearing for managerial franchises pins down the price χ_{jt-1}^M:

$$\chi_{jt-1}^M = \frac{1}{R_t} \mathbb{E}_{t-1} \left(\begin{array}{c} \theta_d D_{jt} - \xi \mathbb{I}(\Pi_{jt}^{Street} < \Pi_{jt}^f) Q_{jt} \\ +\lambda_e Q_{jt} + \lambda_s s_{jt} Q_{jt} + \chi_{jt}^M \end{array} \right).$$

Repeated forward substitution into the expression for manager consumption in period t therefore implies that in period t the manager born in $t-1$ maximizes the present discounted stream of manager utilities from period t onwards, exactly the objective stated in the text.

Note that because they are exogenous to the manager's linear payoffs, the manager consumption endowments $\bar{C}^M Q_t$ and transfers T_t^M do not impact manager policies or intermediate goods firm values. However, both terms are useful technically. A high enough value of $\bar{C}^M$ ensures that potentially negative dividends and clawbacks ξ^{pay} do not result in negative manager consumption levels. Meanwhile an appropriate and maintained choice of $T_t^M = -\int \theta_d D_{jt} dj + \int \xi^{pay} \mathbb{I}(\Pi_{jt} < \Pi_{jt}^f) Q_{jt} dj$ ensures that manager consumption on aggregate is equal to exogenous endowment levels $\bar{C}^M Q_t$ exactly. Hence, household consumption can be backed out via the resource constraint, i.e.

$$C_t = Y_t - X_t - AC_t - Z_t - \Xi_t^{firm},$$

which is the expression used to argue for $R_t = R$ above.

Also, trivially note that the analyst problem yields $\pi^f_{jt} = \mathbb{E}_\mu(\pi_{jt}|\pi_{jt-1})$ given the mean squared error loss function for analysts. Omitting t and j subscripts for clarity, using $'$ to denote future periods, and writing the manager problem recursively yields

$$V^M(a,\varepsilon,q,\pi^f) = \max_{z,m,s}\left\{\theta_d d - \xi\mathbb{I}(\pi < \pi^f)q + \lambda_e q + \lambda_s s q + \left(\frac{1+g}{R}\right)\mathbb{E}V^M(a',\varepsilon',q',\pi^{f'})\right\}$$

$$d = (1-\tau_c)\left(\beta(a+\varepsilon)qL(1-\gamma_s s) - zq\right) - \gamma_m m^2 q$$

$$\pi = (1-\tau_c)(\beta(a+\varepsilon)L(1-\gamma_s s) - z) + m$$

$$a' = (1-\rho_a) + \rho_a a + \zeta', \quad \zeta' \sim N(0,\sigma_a^2), \quad \varepsilon' \sim N(0,\sigma_\varepsilon^2)$$

$$q' = \begin{cases} \frac{\lambda q}{1+g}, & \text{with prob. } \Phi(z) = Az^\alpha \\ \max\left\{\frac{q}{1+g},\omega\right\}, & \text{with prob. } 1-\Phi(z) \end{cases}$$

$$\pi^{f'} = \mathbb{E}_\mu\left(\pi'|\pi\right).$$

The stationary, recursive, normalized intermediate goods firm manager problem above features discounting at rate $(1+g)/R$ rather than $1/R$, and sees "depreciation" of normalized relative long-term quality levels q by the rate g each period. The manager problem also allows for the influence of corporate taxes, through the τ_c marginal rate, on firm decisions.[56] In this form, the problem can be solved using standard numerical dynamic programming techniques, as discussed in Appendix C below. Also, once optimal policies are obtained, a similar recursive structure obtains for intermediate goods firm values themselves through direct substitution of manager optimal policies.

Now I explicitly define the notion of stationarity which must be satisfied by the distribution of normalized state variables $\mu(a,\varepsilon,q,\pi^f)$. The distribution must be invariant to forward iteration on both the exogenous driving profitability processes a and ε as well as the endogenous forecast and long-term quality transitions. Let $z(a,\varepsilon,q,\pi^f)$, $m(a,\varepsilon,q,\pi^f)$, and $\pi(a,\varepsilon,q,\pi^f)$ be the optimal R&D policy, optimal accounting manipulation policy, and induced normalized Street earnings functions, and let $f_a(a'|a)$ and $f_\varepsilon(\varepsilon)$ be the transition and density functions for the exogenous processes. Formally, the stationary distribution μ satisfies the following condition:

[56] All numerical results in the paper incorporate income taxation at a marginal 35% rate, but this consideration is omitted from the main text for brevity.

$$\mu(a',\varepsilon',q',\pi^{f'}) = \begin{array}{c} \int \Phi\left(z(a,\varepsilon,q,\pi^f)\right) f_a(a'|a) f_\varepsilon(\varepsilon')\mathbb{I}\left[q' = \frac{\lambda q}{1+g}, \pi^{f'} = \mathbb{E}(\pi'|\pi(a,\varepsilon,q,\pi^f))\right] d\mu(a,\varepsilon,q,\pi^f) \\ + \\ \int \left(1-\Phi\left(z(a,\varepsilon,q,\pi^f)\right)\right) f_a(a'|a) f_\varepsilon(\varepsilon')\mathbb{I}\left[q = \frac{q}{1+g}, \pi^{f'} = \mathbb{E}(\pi'|\pi(a,\varepsilon,q,\pi^f))\right] d\mu(a,\varepsilon,q,\pi^f). \end{array}$$

The aggregation condition which must further be satisfied on a stationary balanced growth path, which guarantees that the aggregate growth rate of long-term quality is generated by firm policies and the stationary distribution μ, is reported here.

$$1+g = \frac{Q'}{Q} = \begin{array}{c} \int \Phi(z(a,\varepsilon,q,\pi^f))\lambda q d\mu(a,\varepsilon,q,\pi^f) \\ + \int_{q>\omega(1+g)}(1-\Phi(z(a,\varepsilon,q,\pi^f)))q d\mu(a,\varepsilon,q,\pi^f) \\ + \int_{q\leq\omega(1+g)}(1-\Phi(z(a,\varepsilon,q,\pi^f)))\omega(1+g) d\mu(a,\varepsilon,q,\pi^f) \end{array} \quad (1)$$

The first term represents quality growth generated by quality ladder innovation arrivals, the second term represents quality growth from lagging-quality firms away from the diffusion bound ω, and the final term represents quality growth from lagging quality firms at the diffusion boundary.

Note that the model used for *cost* estimation in Section 4 imposes $\lambda_e = \lambda_s = s_{jt} = 0$ and $\xi = \xi^{manager}$, i.e. the model assumes away agency conflicts and mechanical resource costs of earnings misses, while the shirking model in Section 6 assumes $\lambda_e = 0$ and the empire building case in Section 6 assumes $\lambda_s = s_{jt} = 0$. Both models of Section 6 assume $\xi = (1-\theta_d)\xi^{pay}$, i.e. that the costs of earnings misses represent explicit manager compensation policies.

B.3 Welfare and Firm Value Change Formulas

The total consumption equivalent welfare gains from the removal of earnings targets, i.e. moving from $\xi > 0 \to \xi = 0$ comparing balanced growth paths only, can be written as 100Δ where Δ satisfies the following equation:

$$\sum_{t=0}^{\infty}\rho^t \frac{(C_{t,targets}(1+\Delta))^{1-\sigma}}{1-\sigma} = \sum_{t=0}^{\infty}\rho^t \frac{(C_{t,notargets})^{1-\sigma}}{1-\sigma}.$$

All "targets" subscripts refer to cases with $\xi > 0$ and "notargets" subscripts refer to cases with $\xi = 0$. Trivially, this yields the following formula and decomposition of the welfare gains from removal of the earnings target friction:

$$\Delta = \underbrace{\frac{C_{0,notargets}}{C_{0,targets}}}_{\text{Static}} \underbrace{\left(\frac{1-\rho(1+g_{targets})^{1-\sigma}}{1-\rho(1+g_{notargets})^{1-\sigma}}\right)^{\frac{1}{1-\sigma}}}_{\text{Dynamic}}.$$

The above welfare calculations are general equilibrium, in that they take into account all aggregate changes in growth rates, forecasting systems, and the stationary distribution of the economy when targets are removed. By contrast, the partial equilibrium change in firm value resulting from the removal of earnings targets is computed leaving these quantities unchanged, since from the perspective of the firm such aggregates are fixed. The resulting formula for the average change in firm value used in the text is

$$100\mathbb{E}_{\mu_{targets}} \log\left(\frac{V_{notargets}}{V_{targets}}\right).$$

Note that the text reports in the cost estimation of Section 4 a conservative version of the measures above which omit the direct effect of the removal of earnings targets costs on the aggregate consumption level and firm value by assuming costs are private to the manager, $\xi = \xi^{manager}$. Therefore, there is no mechanical effect of the target removal on aggregate household consumption or firm dividends through a resource channel. By contrast Section 6, which assumes that miss costs are based on manager compensation, prevents a mechanical impact of miss costs on aggregate consumption through the lump-sum transfers away from managers but does allow for clawback to increase firm flow dividends for valuation purposes.

B.4 Adding Measurement Error

The main text shows results for a version of the baseline model with "target measurement error" ν_{jt} for firms. ν_{jt} is a transitory white noise disturbance with variance σ_ν^2 for firm j in period t which is unknown at the time manager policies are determined but shifts the realized profits for firms and hence the relevant earnings target. More precisely, this involves replacement of the standard intermediate goods firm manager optimization problem from the equilibrium definition above with one that incorporates ν_{jt}:

$$\max_{z_{jt},m_{jt},p_{jt}} \mathbb{E}\left\{\sum_{t=0}^{\infty}\left(\frac{1}{R}\right)^t \left(\begin{array}{c}(1-\tau_c)\left(\Pi_v(Q_{jt},a_{jt},\varepsilon_{jt},p_{jt})-z_{jt}Q_{jt}\right)\\ -\gamma_m m_{jt}^2 Q_{jt} - \tilde{\xi}\mathbb{I}((\Pi_{jt}^{Street}+\nu_{jt})<\Pi_{jt}^f)Q_{jt}\end{array}\right)\right\}$$

$$Q_{jt+1} = \begin{cases} \lambda Q_{jt}, & \text{with probability } \Phi(z_{jt}) \\ \max(Q_{jt},\omega Q_{t+1}), & \text{with probability } 1-\Phi(z_{jt})\end{cases}, \quad \Phi(z_{jt}) = Az_{jt}^\alpha$$

$$a_{jt} = (1-\rho_a)+\rho_a a_{jt-1}+\zeta_{jt}, \quad \zeta_{jt}\sim N(0,\sigma_a^2), \quad \varepsilon_{jt}\sim N(0,\sigma_\varepsilon^2), \quad \nu_{jt}\sim N(0,\sigma_\nu^2)$$

In practice, since ν isn't a state variable for the firm at the time policies are determined, the recursive normalized problem can be modified from the statement above to the following form:

$$V^M(a,\varepsilon,q,\pi^f) = \max_{z,m}\left\{\left(\begin{array}{c}(1-\tau_c)\left(\beta(a+\varepsilon)qL-zq\right)\\ -\gamma_m m^2 q - \tilde{\xi}\mathbb{E}_\nu\mathbb{I}((\pi+\nu)<\pi^f)q\end{array}\right)+\left(\frac{1+g}{R}\right)\mathbb{E}V^M(a',\varepsilon',q',\pi^{f'})\right\}$$

$$\pi = (1-\tau_c)(\beta(a+\varepsilon)L-z)+m$$

$$a' = (1-\rho_a)+\rho_a a+\zeta', \quad \zeta'\sim N(0,\sigma_a^2), \quad \varepsilon'\sim N(0,\sigma_\varepsilon^2), \quad \nu\sim N(0,\sigma_\nu^2)$$

$$q' = \begin{cases} \frac{\lambda q}{1+g}, & \text{with prob. } \Phi(z) = Az^{\alpha} \\ \frac{\max\{\omega, q\}}{1+g}, & \text{with prob. } 1 - \Phi(z) \end{cases}$$

$$\pi^{f'} = \mathbb{E}_{\mu}\left(\pi' | (\pi + \nu)\right).$$

Note that since the measurement error version is only discussed in the context of the cost estimation model with $\lambda_e = \lambda_s = s = 0$, I omit those terms from the dividend flows above and write the earnings miss costs as $\tilde{\xi}$, which is simply equal to ξ/θ_d in previous notation.

C Numerical Solution

The aggregates of the model which are crucial for the general equilibrium solution include the growth rate g and the forecast function $\pi^f = \mathbb{E}_\mu(\pi|\pi_{-1})$. I approximate the forecast function with a linear rule $\pi^f = \eta_0 + \eta_1 \pi_{-1}$. Comparison of model-implied conditional expectations and linear forecasts in Figure C.2, as well as a range of forecast accuracy checks with higher-order forecast rules and extended information sets in Table C.7 indicate that the linear forecast approximation based on lagged earnings is quantitatively succesful.

Given the forecast rule approximation, the model is solved via a combination of discretization, policy iteration, and nonstochastic simulation, together with an outer loop over aggregates. In other words, the rough solution algorithm, given a parameterization of the model, consists of:

1. Guess values for the aggregate growth rate g, as well as forecast coefficients η_0, η_1.
   (a) Solve the normalized, recursive manager Bellman equation stated in Appendix B to some specified tolerance, using discretization of the exogenous processes as discussed below, discretization of value and policy functions, and policy iteration. Within this step, the manager discounts the future using the growth-rate normalization as well as interest rate implied by the guess for g and the household Euler equation, and earnings targets transition according to the assumed forecast coefficients on normalized reported Street earnings.
   (b) Given a solution to the firm problem, use the nonstochastic simulation approach of Young (2010) to iterate forward on exogenous processes and endogenous transitions until a stationary distribution μ is obtained to some tolerance.
   (c) Compute the implied aggregate growth rate $\tilde{g}$, as well as the implied forecast coefficients $\tilde{\eta}_0, \tilde{\eta}_1$.
2. If the maximum absolute differences between the guessed and implied growth rates and forecast coefficients are less than some predetermined tolerances, the model is solved. If the outer loop has not yet converged, then update either the growth rate (using bisection) or the forecast coefficients (using dampened fixed-point iteration), until they converge to model-implied values.

Some of the practical choices for numerical implementation are listed in the table below. The model is solved using Fortran with heavy parallelization. Note that when required, forward iterations of endogenous variables required both for distributional iteration as well as expectations in the manager Bellman equation use linear interpolation in the endogenous variable.

Table C.6 records robustness checks to the Baseline parameterization in the text. Also, Figure C.3 displays the ergodic or stationary marginal distributions of model state and policy variables in the Baseline and No Targets economies.

Table C.5: Some practical numerical choices

Object	Value	Explanation
n_q	25	Density of q grid
	[0.08,12.24]	Bounds of q grid
n_π	20	Density of π grid
	[-0.5,1.5]	Bounds of π grid
n_a	7	Density of a grid
	[0.59,1.41]	Bounds of a grid
n_ε	3	Density of ε grid
	[-0.20,20]	Bounds of ε grid
n_z	15	Density of z grid
	[0.0,0.5]	Bounds of z grid
n_m	15	Density of m grid
	[-0.5,0.5]	Bounds of m grid
N_{Howard}	250	Number of Howard accelerations
ε_{pol}	0.0	Tolerance for discretized policy convergence
ε_{dist}	1e-9	Tolerance for distributional convergence
$\varepsilon_{outer,g}$	1e-5	Tolerance outer GE loop for g
$\varepsilon_{outer,\eta}$	1e-2	Tolerance outer GE loop for η
η_{update}	0.25	Dampening weight on new values for η

Note: The table above describes some practical numerical choices made to solve the normalized recursive model described in the Appendix B. The model is solved with discretization, and the grid boundaries as well as densities are displayed above together with tolerances for the various fixed-points required by the model and described in the numerical solution overview.

Table C.6: Robustness checks to the baseline model

%	Δg	ΔW_{stat}	ΔW_{dyn}	ΔW	$\Delta\mathbb{E}$ (R&D z)	$\Delta\sigma$ (R&D z)
$\sigma_a = 0.04$	0.11	-1.09	2.51	1.40	7.20	-23.12
$\sigma_a = 0.12$	0.06	2.74	1.29	4.06	5.11	-11.20
$\sigma_\varepsilon = 0.06$	0.06	-0.71	1.27	0.55	0.63	-22.42
$\sigma_\varepsilon = 0.14$	0.06	-0.06	1.29	1.23	3.80	-29.31
$\rho_a = 0.85$	0.06	-1.66	1.36	-0.33	4.17	-45.52
$\rho_a = 0.95$	0.06	0.22	1.45	1.67	3.98	-10.41
$A = 0.21$	0.05	-0.32	1.25	0.92	2.25	-5.57
$A = 0.275$	0.06	-0.13	1.32	1.19	3.68	-23.05
$\gamma_m = 0.25$	0.05	-0.57	1.18	0.61	3.18	-31.37
$\gamma_m = 0.35$	0.07	-0.82	1.48	0.65	0.90	-26.13
$\gamma_m = \infty$	0.05	-1.04	1.12	0.08	4.50	-54.54
$\xi = 0.5\hat{\xi}$	0.05	-1.37	1.04	-0.34	0.17	-22.74
$\xi = 2.0\hat{\xi}$	0.13	-0.30	2.96	2.64	6.53	-44.27
$\alpha = 0.4$	0.07	-0.86	1.55	0.68	8.08	-30.93
$\alpha = 0.6$	0.08	-0.15	1.94	1.79	2.07	-25.90
$\beta = 0.5$	0.07	0.21	1.84	2.06	2.28	-25.01
$\lambda = 1.2$	0.05	-0.32	1.57	1.25	8.86	-35.29
$\omega = 1/\sqrt{175} = 0.076$	0.06	-1.54	1.36	-0.20	3.21	-27.24
$\omega = 1/\sqrt{125} = 0.089$	0.05	0.02	1.2	1.22	2.16	-19.69
Random Walk Forecast	0.01	1.44	0.15	1.57	1.10	-25.89
Quadratic Fcst	0.07	0.05	1.62	1.67	3.69	-23.85
Fcst Bias $= 0.01$	0.08	-0.80	1.82	1.01	6.05	-31.90
Fcst Bias $= -0.01$	0.06	-0.86	1.32	0.44	0.32	-23.06
Target Measurement Error	0.10	-1.04	2.21	1.15	9.24	-14.09
Baseline	0.06	-0.86	1.32	0.44	0.32	-23.1

Note: The entries above represent percent differences between the counterfactual No Targets and estimated Targets cases. The moments are computed from the stationary distributions μ of the respective economies.

Table C.7: **Alternative forecast system accuracy**

Higher-Order Terms	RMSE	New Information Terms	RMSE
Mean Only	1.0000	Mean Only	1.0000
Add $\eta_1\pi_{-1}$	0.8998	Add $\eta_1\pi_{-1}$	0.8998
Add $\eta_2\pi_{-1}^2$	0.8993	Add $\eta_2(\pi_{-1} - \pi_{-1}^f)$	0.8852
Add $\eta_3\pi_{-1}^3$	0.8993	Add $\eta_3 z_{-1}$	0.8801

Note: All statistics are computed using the stationary distribution μ of the Baseline model, based on a forecast system of $\pi^f = \eta_0 + \eta_1\pi_{-1}$. RMSE is the root mean squared error of a given forecasting rule, i.e. for system i, $\text{RMSE}_i = \sqrt{\mathbb{E}_\mu\left(\pi_i^f - \pi\right)^2}$, where π_i^f is the forecast from system i and π is model Street earnings from the Baseline. Each column reports the scaled value of $\text{RMSE}_i/\text{RMSE}_1$, where RMSE_1 is the RMSE implied by the forecast rule with only a constant or mean prediction. Movement down rows within each column tracks forecast accuracy improvement when sequentially adding terms to the mean only forecast rule.

C.1 Smooth versus Threshold Incentives

The analysis carried out in the main text relies upon incentives for managers taking a threshold or discontinuous form. Normalized manager payoffs are given by

$$d^m = \theta_d d - (1-\theta_d)\xi^{pay}\mathbb{I}(\pi < \pi^f)q + (\text{ } \textit{Manager Private Payoffs} \text{ }).$$

As denoted above, let V^{firm} be firm value in this case. Then, given any set of agency parameters determining manager private payoffs, consider a smooth contract indexed by coefficients β that results in manager payoffs d^m given by

$$d^m = \theta_d d + (1-\theta_d)\sum_{k=1}^{N}\beta_k(\pi^f - \pi)^k q + (\text{ } \textit{Manager Private Payoffs} \text{ }).$$

Assume that the rest of the model structure remains unchanged, and that firm value in that case can be written V_β^{firm}. Define the optimal smooth contract within this class β^* as

$$\beta^* = \arg\max_\beta \mathbb{E}_\mu V_\beta^{firm},$$

where averages are taken with respect to the stationary distribution of the model in the cash with threshold targets μ and only partial equilibrium changes are considered with aggregates and the forecast system held constant. Table C.8 reports the average increment in firm value in the optimal smooth incentives case relative to firm value in the threshold or targets model, equal to $100\mathbb{E}_\mu \log\left(\frac{V_{\beta^*}^{firm}}{V^{firm}}\right)$. The shirking and empire building parameters used in Table C.8 are chosen to lie in the middle of the reported range in Figure 9 and Figure 10, respectively, and I implement the numerical optimization via particle swarm optimization.

Table C.8: Increased firm value from smooth incentives

% of Firm Value	Gains over Targets
Shirking	0.64
Empire Building	0.90

Note: The entries are the mean percentage change in firm value from the use of optimal smooth incentives relative to the use of estimated target incentives, in partial equilibrium. Averages are taken with respect to the unconditional distribution of the model given target incentives, and the results are computed assuming a polynomial of degree $k = 3$. The "Shirking" row imposes agency parameters $\lambda_s = 0.002$ and $\gamma_s = 0.075$, chosen to deliver the maximum firm value gain from targets relative to no incentives (around 1%). The "Empire Building" row imposes agency parameter $\lambda_e = 0.006$, chosen to deliver approximate firm indifference between targets and no incentives. Both are moderate calibrations approximately in the center of the investigated ranges for agency conflict parameters in Figures 9 and 10.

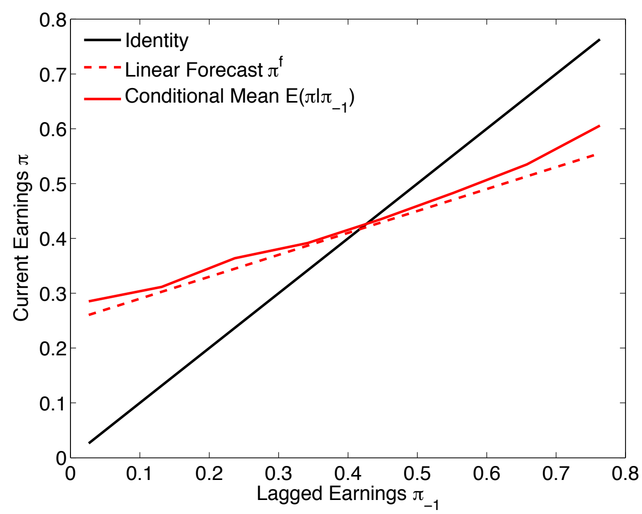

Figure C.2: Linear forecast rule in the model

Note: The figure plots the linear forecast of normalized earnings π^f, together with the conditional mean of earnings $\mathbb{E}(\pi|\pi^f)$, given lagged earnings π_{-1}, with expectations taken over the stationary distribution of the Baseline model. The model was solved via discretization, policy iteration, and nonstochastic simulation.

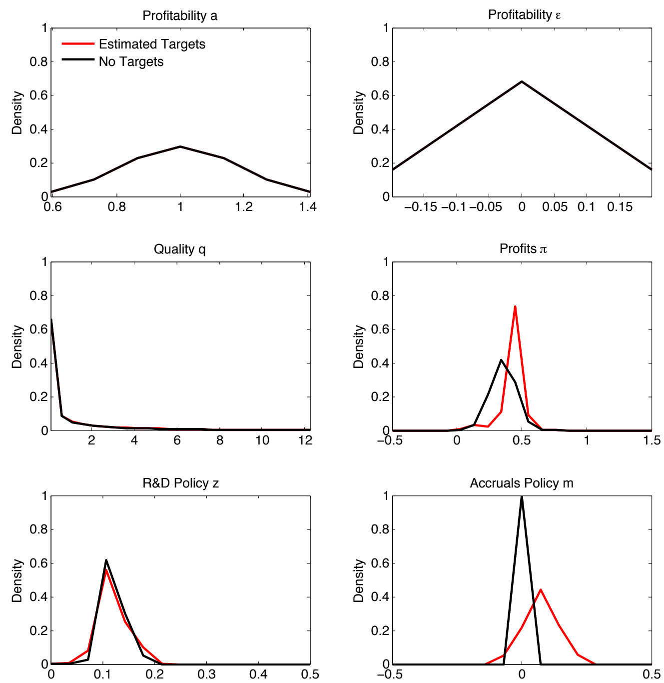

Figure C.3: Ergodic distributions in the model

Note: The figure plots the marginal ergodic distributions of the firm-level state variables and policy variables in both the estimated Baseline model and the counterfactual No Targets economy. The model was solved via discretization, policy iteration, and nonstochastic simulation.

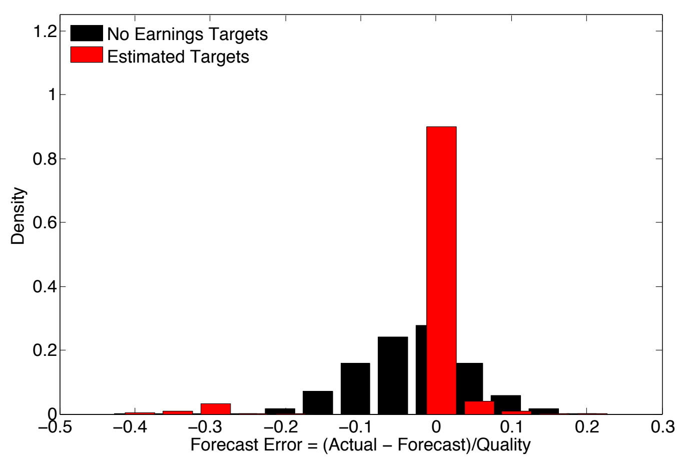

Figure C.4: Forecast error distribution, no measurement error

Note: The figure above represents the distribution of forecast errors $\pi - \pi^f$ computed from the stationary distribution of the balanced growth path associated with both the estimated earnings miss cost $\hat{\xi}$ (in red) and the counterfactual $\xi = 0$ (in black).

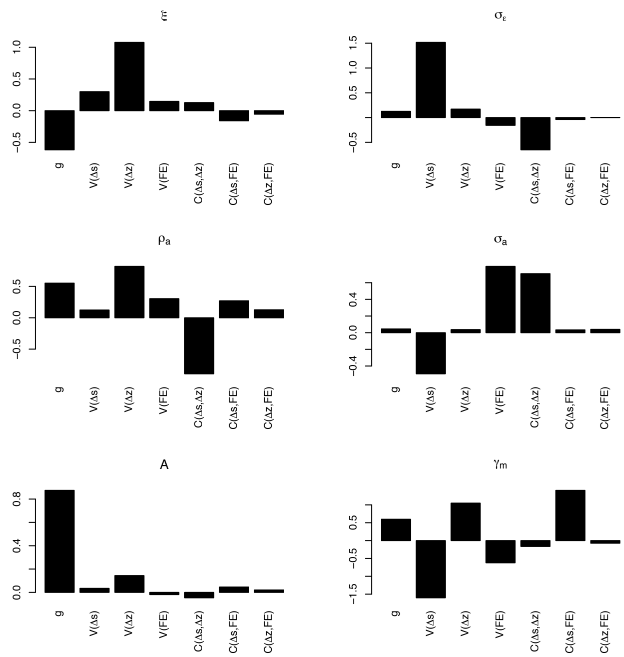

Figure C.5: Gentzkow-Shapiro elasticities of estimated model parameters to moments

Note: The figure plots Gentzkow and Shapiro (2014) sensitivity estimates of each of the estimated model parameters to the seven moments used in GMM estimation of the baseline model. The sensitivity estimates represent the coefficients of a theoretical regression of the estimated parameters on data moments over their joint asymptotic distribution. For ease of reference, the sensitivity parameters are reported as elasticities of the parameter to the relevant data moment. The label g represents the aggregate growth rate, while microeconomic moment labels V and C are variance and covariance, respectively, for sales growth Δs, R&D growth Δz, and forecast errors FE.

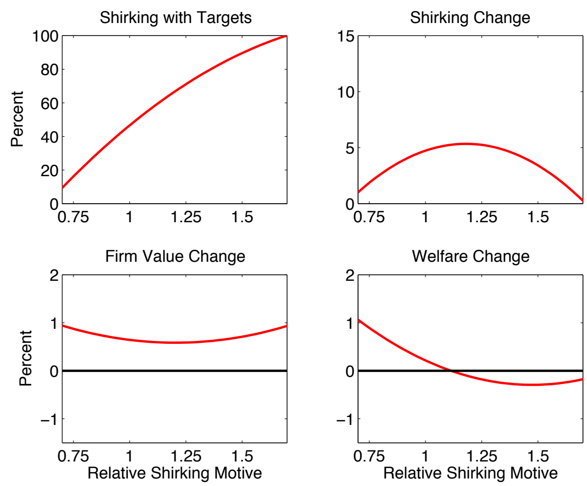

Figure C.6: Targets can prevent shirking

Note: Horizontal axis is $r(\lambda_s) = \lambda_s/\mathbb{E}(\theta_d \Pi_v \gamma_s/q)$, where $\gamma_s = 0.025$. The top left panel plots the average shirking level $100\mathbb{E}_\mu s$ with targets, the top right panel plots the percent difference in shirking from target removal, the bottom left panel plots the average PE percent change in firm value from target removal, and the bottom right panel plots the GE total consumption equivalent percent change in social welfare from target removal. Numerical comparative statics are smoothed using a polynomial approximation.