Lecture 9: Gaming the System

Compensation in Organizations

Jacob Kohlhepp

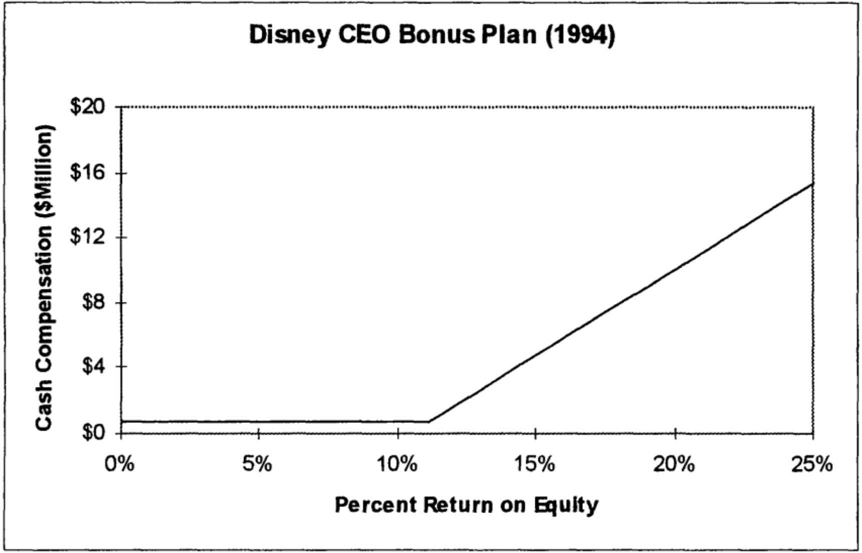
February 18, 2026

Table of Contents

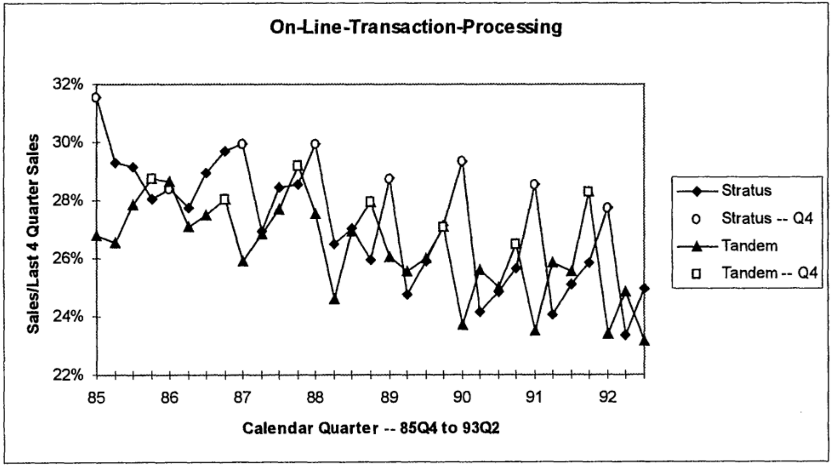
Oyer (1998) “Fiscal year Ends and Nonlinear Incentive Contracts”

- Many performance pay contracts observed in practice are nonlinear.
  - Salespeople get a discrete bonus when they achieve quota, execs. start getting bonus when they hit a profitability threshold.
- This creates an incentive to strategically delay or speed up sales.
- Crucially fiscal year ends vary across firms.
- Main result: across the economy, sales are lower in the beginning of a firm’s fiscal year and higher at the end.

Oyer (1998): Example of Non-Linear Incentives



Oyer (1998): Example of Two Competing Firms



Fiscal Year Ends: Tandem - September; Stratus - December

Oyer (1998): Impact of Fiscal Year End on Sales (All Manufacturing Firms)

TABLE IIa
EFFECT OF CALENDAR AND FISCAL YEAR ON REVENUE
DEPENDENT VARIABLE: ln (FISCAL QUARTER SALES) − ln (PREVIOUS FISCAL QUARTER SALES)

	(1)	(2)	(3)
Δ(Fiscal quarter = 1)	---	−.0481 (.0030)	---
Δ(Fiscal quarter = 4)	---	0.0267 (.0030)	---
Δ(Fiscal quarter effects by three-digit industry)	no	no	Reported in Table IIb
Δ(Calendar month effects by three-digit industry)	yes	yes	yes
N (company quarters)	19,732	19,732	19,732
R^2	.141	.167	.191

Oyer (1998): Impact of Fiscal Year End on Prices (All Manufacturing Firms)

TABLE IIIa
EFFECT OF CALENDAR AND FISCAL YEAR ON PRICES
DEPENDENT VARIABLE: CHANGE IN (ln(SALES) − ln(COST OF GOODS SOLD)) FROM PREVIOUS QUARTER

	(1)	(2)	(3)
Δ(Fiscal quarter = 1)	---	0.0072 (.0018)	---
Δ(Fiscal quarter = 4)	---	−.0166 (.0019)	---
Δ(Fiscal quarter effects by industry)	no	no	Reported in Table IIIb
Δ(Calendar month effects by industry)	yes	yes	yes
N (company quarters)	18,792	18,792	18,792
R^2	.030	.039	.048

Discussion: Larkin (2014)

“The Cost of High-Powered Incentives” (Larkin 2014)

- Setting: enterprise software salespeople between 1997 and 2003
- Salespeople only close between 1-2 deals a quarter (often they close 0)
- But deals are massive: median deal is $350,000
- Performance pay is nonlinear (so gaming is possible)
- Salespeople had the ability to discount prices.
- Nearly 67% of deals closed the last day of the quarter

Larkin (2014): Nonlinear Pay (Accelerators)

Table 1
Illustrative Enterprise Software Salesperson Quarterly Commission Schedule

Sales Revenue Generated	Commission Accelerator	Incremental Commissions Earned
First $500,000 in sales	1 times	3% of sales (max of $15,000)
Next $500,000 in sales	2 times	6% of incremental sales (max of $30,000)
Next $1 million in sales	3 times	9% of incremental sales (max of $90,000)
Next $2 million in sales	4 times	12% of incremental sales (max of $240,000)
Next $2 million in sales	6 times	18% of incremental sales (max of $360,000)
Any sales above $6 million	8 times	24% of incremental sales

Source.—Disguised example from company providing data for this research.
Note.—Does not include base salary of $12,000 per quarter.

Larkin (2014): Suggestive Evidence of Discounting

Table 3
Summary Statistics and Customer Analysis of Early, Late, and Middle Deals

Customer Type	Unit	Early Deals (C_E)	Middle Deals (C_M)	Late Deals (C_L)
Variable averages:				
Total price paid	$1,000	548	532	564
Total discount given	%	34.6	28.8	36.2
Salesperson tenure	No. of quarters	9.5	9.2	10.1
Annual revenue of customer	$ billion	6.0	6.0	6.7
Marginal salesperson commission	$1,000	41.1	29.4	41.9
Hypothetical marginal commission had the deal closed a quarter earlier	$1,000	24.3	30.2	29.0
Hypothetical marginal commission had the deal closed a quarter later	$1,000	33.4	33.7	23.1
Percentage of deals by customer type:				
All customers	%	8.8	17.0	74.2
Private-sector customers	%	8.6	16.5	74.9
Government and education customers	%	9.3	17.8	72.9
Customers with previous purchases early or late in the financial quarter	%	8.3	16.6	75.1
Customers with no previous purchases from the vendor	%	8.8	17.1	74.1

Larkin (2014): Pushing and Pulling Deals

Table 4
Deal Timing Model, Marginal Effects after Multinomial Logit

	$\Pr(C_E) - \Pr(C_M)$ (A)	$\Pr(C_L) - \Pr(C_M)$ (B)	X (Average Variable Value) (C)
Hypothetical	.008	.000	10.9
commission Δ_{t-1}	(.004)**	(.001)	
Hypothetical	−.006	.019	13.9
commission Δ_{t+1}	(.008)	(.007)***	
Log deal size	.081	−.045	6.32
	(.079)	(−.050)	
Salesperson tenure	.014	.031	9.90
	(.005)***	(.011)***	
Vendor quarter 4 deal	.030	.065	.30
	(.021)	(.016)***	
Log customer revenues	−.002	.003	
	(.002)	(.002)	.81
Customer quarter 4 deal	.010	−.036	.28
	(.008)	(.024)	
Controls not reported	Product line, operating system, industry, sales region		
Log psuedo likelihood	−2,001.3		
Pseudo R^2	.112		

Larkin (2014): Discounting Price to Close Faster

Table 5
Deal Outcomes Model, OLS Results

Variable	Baseline Salesperson Fixed-Effects Model (A)	Simple Deadline Effects Model (B)	Deadline Effects Model with Compensation Concerns (C)	Historical Product Pricing Variance Model (D)	Historical Customer Discount Model (E)
Constant	−2.98	−4.32	−1.66	−.96	−2.15
	(3.37)	(2.31)*	(1.43)	(1.04)	(1.76)
Hypothetical commission Δ_{t-1} (ΔMB_{t-1})	.26		.29	.22	.19
	(.09)***		(.10)***	(.06)***	(.07)***
Hypothetical commission Δ_{t+1} (ΔMB_{t+1})	.44		.53	.47	.34
	(.16)***		(.15)***	(.16)***	(.12)***
Closes early in quarter (C_E)		1.90	−.67		
		(.71)***	(.80)		
Closes late in quarter (C_L)		3.78	−1.01		
		(1.44)***	(1.03)		
Historical product price variance				.07	
				(.04)*	
Historical product price variance × ΔMB_{t-1}				−.00	
				(.01)	
Historical product price variance × ΔMB_{t+1}				.01	
				(.02)	
Historical customer discount					.32
					(.12)***

Larkin (2014): Summary

- Sales people push or pull deals to manipulate the pay scheme.
- Estimated cost to revenue is between 5.69% and 8.65%
- Main challenge: is this gaming or price discrimination?
- The paper addresses this indirectly but cannot fully rule it out.
- Nonlinear incentive schemes cause these sorts of problems.
- This is one reason to use linear compensation!

Table of Contents

Roy (1952)

- Sociologist Donald Roy worked “undercover” in a steel-processing plant for 11 months.
- He kept a journal of his production and observations.
- The plant used piece rates (performance pay).
- His earnings fluctuated from \$0.09 to \$1.66 per hour.
- Importantly, his hourly earnings were bimodal: he did two “types” of work.

Roy (1952)

- Half the time he produced well above his base rate.
- Half the time he produced well below.
- The distributions are almost completely separate.
- Other workers ancedotally reported doing this too.
- Some possible reasons:
  - learning to do the job.
  - Hard vs. easy work.
  - others?

Roy (1952): The Real Reason

Roy gives a different reason: workers intentionally slacked off to avoid a time study:

an hour wasn't bad, he exploded:

"Averaging, you say! Averaging?"

"Yeah, on the average. I'm an average guy; so I ought to make my buck and a quarter. That is, after I get onto it."

"Don't you know," cried Starkey angrily, "that \$1.25 an hour is the *most* we can make, even when we *can* make more! And most of the time we can't even make that! Have you ever worked on piecework before?"

"No."

"I can see that! Well, what do you suppose would happen if I turned in \$1.25 an hour on these pump bodies?"

"Turned in? You mean if you actually did the work?"

"I mean if I actually did the work and turned it in!"

"They'd have to pay you, wouldn't they? Isn't that the agreement?"

"Yes! They'd pay me—once! Don't you know that if I turned in \$1.50 an hour on these pump bodies tonight, the whole God-damned Methods Department would be down here tomorrow? And they'd retime this job so quick it would make your head swim! And when they retimed it, they'd cut the price in half! And I'd be working for 85 cents an hour instead of \$1.25!"

Roy (1952): The Real Reason

This gave rise to even more blatant slacking off at night:

> One evening Ed Sokolsky, onetime second-shift operator on Jack Starkey's drill, commented on a job that Jack was running:
>
> "That's gravy! I worked on those, and I could turn out nine an hour. I timed myself at six minutes."
>
> I was surprised.
>
> "At 35 cents apiece, that's over $3.00 an hour!"
>
> "And I got ten hours," said Ed. "I used to make out in four hours and fool around the rest of the night."
>
> If Sokolsky reported accurately, he was "wasting" six hours per day.

Return to Our Base Model

- Recall the performance pay model ($w(y) = \alpha + \beta y$)
- What exactly must the firm know to set compensation?
- Recall your homework exercise for the case when $E[\epsilon] = \bar{y}$, with cost that is $c(e) = e^2/2$:
$$\alpha = \bar{u} + \frac{r\beta^2\sigma^2}{2} - \beta(e + \bar{y}) - \frac{e^2}{2}$$
- The firm needs to know average output absent extra effort: $E[\epsilon] = \bar{y}$

Measuring $\bar{y}$

- How can the firm measure $\bar{y}$?
- Set some arbitrary β, α which is NOT α_P, β_P
- Then the firm knows that $e = \beta$ (why?)
- Then we have that:

$$y = e + \epsilon \leftrightarrow E[y] = e + \bar{y} \leftrightarrow \bar{y} = E[y] - e$$

- The firm can get $E[\epsilon]$ by subtracting effort from average output!

Measuring $\bar{y}$

- How do we estimate this?
- For $i = 1, ..., N$ days, set the piece rate to be some β.
- Then measure output and compute the following:

$$\hat{y}_N = \frac{1}{N}\sum_{i=1}^{N} y_i - \beta$$

- As we get enough data the law of large numbers means that:

$$\lim_{N\to\infty} \frac{1}{N}\sum_{i=1}^{N} y_i = E[y] \implies \lim_{N\to\infty} \hat{y}_N = \bar{y}$$

The Ratchet Effect: Using Past Performance for Future Pay

- After learning $\bar{y}$, the firm can set the "right" $\alpha = \alpha_P$:

$$\alpha_P = \bar{u} + \frac{r\beta_P^2\sigma^2}{2} - \beta_P(e_P + \bar{y}) - \frac{e_P^2}{2}$$

- But what if employees know that the firm is doing this?

The Ratchet Effect: Using Past Performance for Future Pay

- After learning $\bar{y}$, the firm can set the "right" $\alpha = \alpha_P$:

$$\alpha_P = \bar{u} + \frac{r\beta_P^2\sigma^2}{2} - \beta_P(e_P + \bar{y}) - \frac{e_P^2}{2}$$

- But what if employees know that the firm is doing this?
- They can choose reduce effort $e = \beta - \delta$ and then:

$$\lim_{N\to\infty} \hat{y}_N = \bar{y} - \delta$$

- The firm underestimates $\bar{y}$ and overpays workers:

$$\alpha_{actual} = \alpha_P + \beta_P\delta$$

Table of Contents

Does It Matter?

- Gaming only matters if it lowers total surplus.
- For example: if sales people work harder the last part of a quarter and less hard during the beginning this is not necessarily destructive.
- But if they are working less hard overall this could be destructive.
- Or if time spent gaming the system takes time away from something productive.
- Question: What are examples of "destructive" gaming?
- Question: What are examples of harmless gaming?

Discussion: Courty and Marschke (2004)

“An Empirical Investigation of Gaming Responses to Explicit Performance Incentives” (Courty and Marschke 2004)

- Question: Does gaming actually decrease welfare?
  - “The main goal of this article is to examine whether this behavior reflects a misallocation of real resources or simply an accounting phenomenon.”
- Contribution: Other papers show gaming happens but it is unclear if it hurts welfare.
- The Job Training Partnership Act (JTPA) gave performance pay to federal bureaucrats.
- Specifically, agencies get rewards for the labor market outcomes of the people they train.
- But, agencies can choose the timing of graduation (there is room for gaming)

More About the JTPA (Courty and Marschke 2004)

- The largest federal employment and training program with $4 billion budget and nearly a million people trained per year.
- Carried out by 620 smaller agencies with a lot of discretion.
- Performance measures (for agency): employment status, wage, earnings, number of weeks worked.
- Measured on date of graduation (which agencies can choose).
- Graduation date must be within 90 days of last training day.
- Most rewards are based on just meeting a minimum standard.
- Rewards were on average 7% of participant budgets.

Gaming the JTPA (Courty and Marschke 2004)

- Theoretically, the agencies want to game the system this way:
  - Graduate everyone who is employed on the first day they are employed.
  - Graduate people who are never employed on the last possible day (day 90).

Gaming the JTPA (Courty and Marschke 2004)

- Theoretically, the agencies want to game the system this way:
  - Graduate everyone who is employed on the first day they are employed.
  - Graduate people who are never employed on the last possible day (day 90).
- They game the system: on average employed people graduate 34 days earlier.
- And the strategy they use is statistically similar to the optimal strategy.
- Only big difference is that agencies wait 101.8 days on average for unemployed (so the 90 day window seems to not be enforced well).
- Employment outcomes would be 20% lower if they graduate people on the last day of training.

Gaming Impacts Welfare (Courty and Marschke 2004)

- Agencies also graduate workers sooner or later (in the current fiscal year or next) in order to meet the standard this year or next.
- This more subtle manipulation seems to hurt worker welfare.
- Specifically delaying graduating leads to reduced length of training.
- The authors estimate 1 day delay in graduation on average reduces earnings gains by $47 for the median enrollee.