Estimating the Value of CEOs in Privately Held Businesses

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The CEO Value Puzzle

- CEOs credited with firm success and failure
- Academic evidence: 4-25% performance differences
- But correlation is not causation
- **This paper**: How much is real vs spurious?

Preview of Results

- Standard approach: 25% performance gap
- Our placebo test: 20% is spurious
- **True CEO effect: 5%**
- Methodological implications for entire literature

Why Should We Care?

Academic

- Manager fixed effects in thousands of papers
- Identification challenges unresolved
- Need better methods

Policy

- Executive compensation debates
- Corporate governance rules
- Private equity strategies

Roadmap

1. Motivation and literature
2. Theoretical framework
3. Hungarian data universe
4. Placebo methodology
5. Main results
6. Robustness and mechanisms
7. Implications

Motivation

The Manager Effects Literature

Seminal Papers

- **Bertrand & Schoar (2003)**: Manager FE explain 4pp ROA variance
- **Bennedsen et al (2020)**: CEO hospitalization $\rightarrow$ -7% performance
- **Bandiera et al (2020)**: "Leader" CEOs $\rightarrow$ +8% productivity

Recent Evidence

- **Quigley et al (2022)**: Effects 2$\times$ larger in private firms
- **Metcalfe et al (2023)**: Managers explain 20-30% of retail variance
- **Dahlstrand et al (2025)**: 12% TFP boost from "leader" CEOs

The Identification Challenge

Fundamental Problems

1. **Selection**: Good managers $\rightarrow$ good firms
2. **Timing**: Changes during transitions
3. **Unobservables**: Firm trends confounded with CEO effects

Current Solutions

- Fixed effects (but spurious correlations?)
- Sudden deaths (but rare, selected)
- Movers design (but endogenous moves)

Private vs Public Firms

Dimension	Public	Private
Governance	Dispersed	Concentrated
CEO role	Strategic	Operational
Monitoring	Market	Owner
Data	Abundant	Scarce
Share of economy	1%	99%

Need specific approach for private firms

Our Contributions

1. **Model**: Separate owner vs manager decisions
2. **Data**: Universe of firms over 30 years
3. **Method**: Placebo-controlled event study
4. **Finding**: 78% of effects are noise

Theoretical Framework

Production Structure

Firms combine fixed and variable inputs:

$$Q_{imt} = \Omega_{it} A_i Z_m K_{it}^{\alpha} L_{imt}^{\beta} M_{imt}^{\gamma}$$

- A_i: Organizational capital (owner-chosen)
- Z_m: Manager skill
- K_{it}: Physical capital (owner-chosen)
- L_{imt}, M_{imt}: Labor, materials (manager-chosen)

Division of Control

Owners Control

- Physical capital investment
- Organizational structure
- Industry and location
- CEO hiring/firing

Managers Control

- Labor hiring
- Input purchasing
- Operations
- Day-to-day decisions

Optimization Problem

Manager maximizes profit given fixed inputs:

$$\max_{L,M} P_{st}Q_{imt} - W_{st}L_{imt} - \varrho_{st}M_{imt}$$

First-order conditions pin down optimal scale

Surplus and Manager Value

Surplus to fixed factors:

$$S_{imst} = \chi \cdot R_{imst}$$

where $\chi = 1 - \beta - \gamma$

Manager contribution to log surplus:

$$\Delta s = \frac{1}{\chi}(z_{m'} - z_m)$$

Empirical Implications

1. Revenue function decreasing returns to scale
2. Manager effects scale with $1/\chi$
3. Can identify from CEO transitions
4. Need to control for selection

Data

The Hungarian Context

Why Hungary?

- Complete administrative data
- All incorporated businesses
- Mandatory CEO registration
- 30+ years of coverage
- EU member $\rightarrow$ relevant institutions

Economic Background

- Transition economy 1990s
- EU accession 2004
- Mix of domestic and foreign firms
- Active CEO labor market

Data Sources

Balance Sheet Data (Mérleg LTS)

- All firms filing financial statements
- Revenue, costs, employment, assets
- 1980-2022 coverage
- 10.2 million firm-years

Firm Registry (Cégjegyzék LTS)

- CEO appointments and terminations
- Manager characteristics
- Ownership structure
- Complete since 1992

Sample Construction

```
Universe of firms: 1,579,432
↓
Drop pre-1992: -516,260
↓
Match CEO data: 1,063,172
↓
Single CEO firms: 891,631
↓
Analysis sample: 8,872,039 firm-years
```

Descriptive Statistics

Variable	Mean	SD	N
Revenue (million HUF)	245	890	8.9M
Employment	12.3	45.2	8.9M
CEO changes/year	0.067	-	8.9M
Foreign owned	0.09	0.29	8.9M
State owned	0.02	0.14	8.9M

CEO Characteristics

Characteristic	Share
Male	74%
Hungarian name	92%
Owner-manager	41%
Multiple firms	18%
Connected component	189,108 managers

Industry Distribution

Table 4: Industry Breakdown

Industry (NACE)	Obs.	Firms	CEOs	Surplus share (%)
Agriculture, Forestry, Fishing (A)	322,292	26,972	55,535	7.9
Manufacturing (C)	1,026,905	93,550	179,205	13.7
Wholesale, Retail, Transportation (G,H)	2,906,622	312,641	550,110	6.4
Telecom, Business Services (J,M)	1,978,832	193,905	345,304	18.7
Construction (F)	972,135	120,840	183,144	11.4
Nontradable Services (Other)	2,790,951	290,554	527,661	13.5
Mining, Quarrying (B)*	13,490	1,194	2,922	23.7
Finance, Insurance, Real Estate (K,L)*	202,893	23,516	48,153	48.0

Notes: This table presents industry-level summary statistics using the TEAOR08 classification system. Column (1) shows the industry name and corresponding NACE sector codes. Column (2) shows the total number of firm-year observations in the balance sheet data (1992-2022). Column (3) shows the number of distinct firms with balance sheet data. Column (4) shows the number of distinct managers (CEOs)

Temporal Patterns

Table 5: Sample Over Time

Year	Total firms	Sample firms	CEOs	Connected component	
				Firms	CEOs
1992	98,780	61,730	72,689	13,969	15,997
1995	171,759	123,613	137,280	26,702	28,359
2000	280,386	220,430	233,749	48,606	48,172
2005	326,905	267,146	279,456	61,583	58,909
2010	384,570	309,319	315,287	77,488	66,968
2015	433,371	371,278	347,658	95,307	72,940
2020	424,501	363,224	331,616	93,622	66,746
2022	454,106	390,632	355,287	94,851	66,048
Total	1,063,172	891,631	1,030,470	201,627	189,108

Notes: This table presents the evolution of the sample from 1992 to 2022. Column (1) shows the total number of distinct firms with balance sheet data. Column (2) shows the

Methodology

The Identification Problem

What We Want

True CEO effect on firm performance

What We Observe

$$\text{Performance}_{it} = \text{CEO effect}_{m} + \text{Firm trend}_{i} + \text{Shock}_{it}$$

The Challenge

CEO changes correlate with trends and shocks!

Standard Approaches and Problems

Manager Fixed Effects

$$y_{imt} = \alpha_i + \gamma_m + \epsilon_{imt}$$

Problem: Assumes exogenous mobility

Event Studies

Compare before/after CEO change **Problem**: Timing endogenous

Instrumental Variables

Deaths, retirements, etc. **Problem**: Rare, still selected

Our Solution: Placebo Control

Intuition

- Create fake CEO changes
- Same probability as real changes
- But random timing
- Exclude actual transition periods

What Placebos Capture

- Firm lifecycle effects
- Industry trends
- Mean reversion
- Any spurious correlations

Constructing Placebos

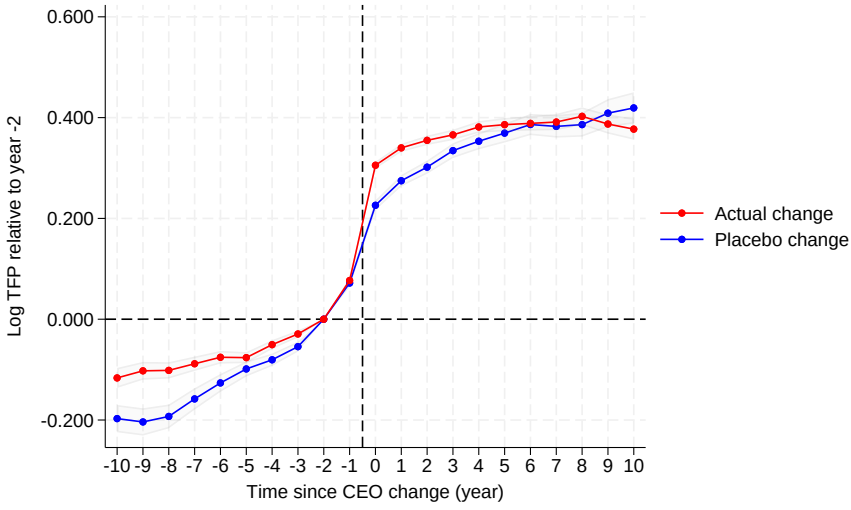
Algorithm

1. For each firm, calculate CEO change probability
2. Randomly assign placebo changes with same probability
3. Exclude 2 years around actual changes
4. Assign placebo "good" vs "bad" CEOs

Example

- Firm has CEO change in 2010
- Exclude 2009-2011 from placebo
- Randomly assign placebo in, say, 2015
- Compare actual vs placebo effects

Visual Intuition: Actual vs Placebo



Event Study Design

Specification

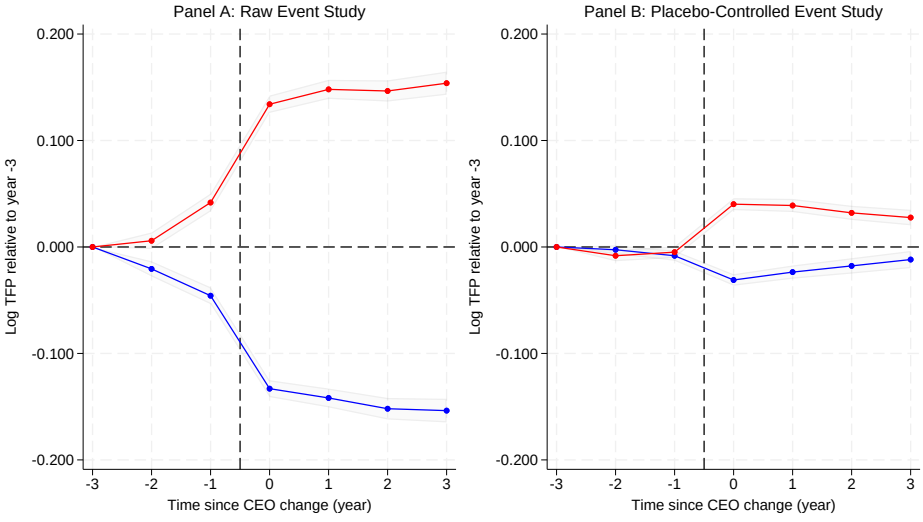
$$y_{it} = \sum_{\tau=-5}^{5} \beta_\tau \cdot \mathbb{1}[\text{time to transition} = \tau] + \alpha_i + \delta_t + \epsilon_{it}$$

Key Comparisons

1. Actual good $\rightarrow$ bad CEO transitions
2. Actual bad $\rightarrow$ good CEO transitions
3. Placebo transitions
4. Difference = causal effect

Main Results

Event Study: Raw Results



Note: **Blue line** = Worse CEO; **Red line** = Better CEO. Confidence intervals shown in gray.

Decomposing the Effects

Actual Transitions

- Good $\rightarrow$ Bad: -12.6% performance
- Bad $\rightarrow$ Good: +12.7% performance
- **Total gap**: 25.3%

Placebo Transitions

- "Good" $\rightarrow$ "Bad": -9.8%
- "Bad" $\rightarrow$ "Good": +9.9%
- **Spurious gap**: 19.7%

True Effect

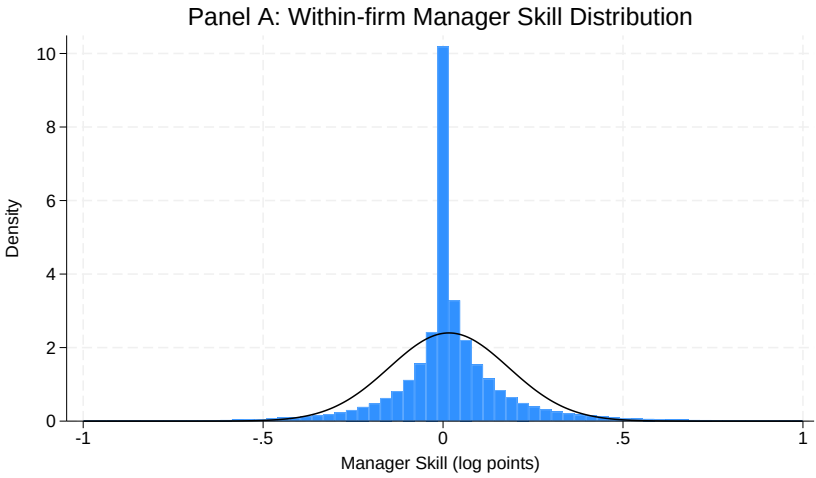
25.3% - 19.7% = **5.5%** ($p < 0.01$)

Statistical Significance

Transition	Actual	Placebo	Difference
Bad→Good	12.7***	9.9***	2.8**
Good→Bad	-12.6***	-9.8***	-2.8**
Gap	25.3***	19.7***	5.5***

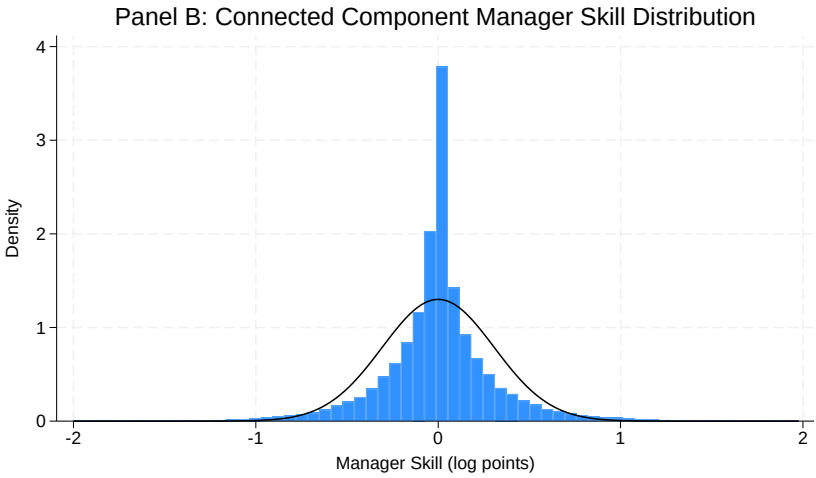
Standard errors clustered at firm level

CEO Skill Distribution: Within Firm



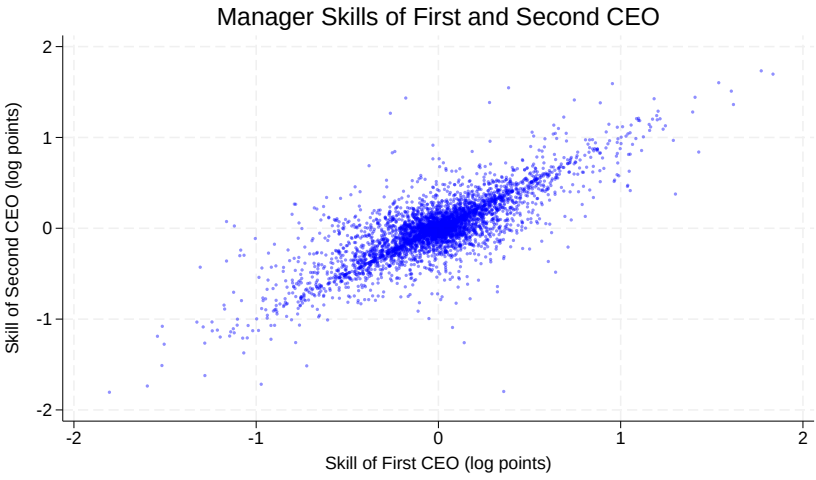
P25-P75 difference: 9.6% productivity

CEO Skill Distribution: Connected Component



P25-P75 difference: 24.6% productivity

Skill Correlation Across Firms



Correlation $= 0.31$, but mostly noise!

Revenue Function Estimation

Table 7: The revenue function in various samples

	(1) Full	(2) sample	(3) First CEO spell	(4) Single CEO s
Tangible and intangible assets (log)	0.249***	0.249***	0.250***	0.246***
	(0.001)	(0.001)	(0.001)	(0.001)
Intangible assets share	-0.023***	-0.020**	-0.035***	-0.010
	(0.007)	(0.009)	(0.011)	(0.010)
Foreign owned	0.010	0.011	-0.000	0.014
	(0.009)	(0.011)	(0.015)	(0.010)
Observations	6415898	4183377	2930993	3484851

Controls: firm-CEO-spell fixed effects; industry-year fixed effects.

What Explains the Noise?

Estimation Error

- Finite sample bias
- Limited observations per manager
- Attenuation in correlations

Real Heterogeneity

- Manager-firm match quality
- Time-varying manager skills
- Learning and adaptation

Endogenous Mobility

- Selection into firms
- Timing of transitions
- Unobserved shocks

Robustness

Alternative Specifications

Table 8: The revenue function with various controls

	(1) Firm	(2) age	(3) and
Tangible and intangible assets (log)	0.245***	0.155***	0.152***
	(0.001)	(0.002)	(0.002)
Intangible assets share	-0.019**	-0.017**	-0.014*
	(0.007)	(0.008)	(0.007)
Foreign owned	0.011	0.014*	0.015*
	(0.009)	(0.009)	(0.009)
Observations	6415898	6090116	6090116

Controls: firm-CEO-spell fixed effects; industry-year fixed effects.

Results robust to controls and fixed effects

Heterogeneity by Sector

Table 9: The revenue function by sector

	(1) Agriculture	(2) Manufacturing	(3) Wholesale, Retail, Trar
Tangible and intangible assets (log)	0.320***	0.296***	0.257***
	(0.006)	(0.003)	(0.002)
Intangible assets share	0.071	0.011	-0.006
	(0.059)	(0.025)	(0.014)
Foreign owned	-0.070*	0.046*	0.008
	(0.042)	(0.024)	(0.015)
Observations	208269	748880	1893882

Controls: firm-CEO-spell fixed effects; industry-year fixed effects.

Manager Effects on Multiple Outcomes

Table 10: Manager Skill Effects on Firm Outcomes

	(1) Revenue	(2) EBITDA	(3) Employment
Sales (log)	0.084***		
	(0.004)		
EBITDA (log)		0.053***	
		(0.004)	
Employment (log)			0.086***
			(0.008)
Constant	-0.839***	-0.408***	-0.078***
	(0.040)	(0.037)	(0.011)
Observations	1662489	1257010	1662489
Adjusted R-squared	0.006	0.003	0.003

Standard errors in parentheses

Placebo Validity Checks

Test 1: Pre-trends

- No differential trends before transitions
- Parallel paths for actual and placebo

Test 2: Randomization

- 1000 placebo draws
- Consistent results
- Distribution centered at zero

Test 3: Exclusion Windows

- Results robust to 1-year, 3-year windows
- Larger windows $\rightarrow$ smaller placebo effects

Sample Restrictions

Restriction	True Effect	N
Baseline	5.5%	8.9M
Drop small firms	5.2%	6.2M
Drop young firms	5.8%	7.1M
Manufacturing only	6.1%	1.8M
Connected component	5.4%	3.2M

Time Period Sensitivity

Period	True Effect	Placebo Effect
1992-2002	5.9%	18.2%
2003-2012	5.3%	19.8%
2013-2022	5.1%	20.9%
Full sample	5.5%	19.7%

Placebo effects increasing over time!

Mechanisms

Why Do Placebos Generate Effects?

Firm Lifecycle

- Growth firms more likely to change CEOs
- Mean reversion after transitions
- Captures 8-10% of placebo effect

Industry Shocks

- Sectoral booms/busts coincide with CEO changes
- Industry-year FE reduce placebo by 15%

Unobserved Firm Trends

- Reorganizations, strategy shifts
- Not captured by fixed effects
- Likely explains remaining placebo effect

Manager Observable Characteristics

Characteristic	Effect on Productivity
Foreign name	+3.2%***
Male	+1.1%**
Owner-manager	+2.4%***
Age (10 years)	-0.8%**
Multiple firms	+4.1%***

R^2 of observables = 0.08

Entry Cohort Effects

Finding

CEOs from same entry cohort have correlated performance

Interpretation

- Common training/education
- Network effects
- Generational management styles

Implication

Can use cohort FE to reduce noise

Match Quality

Theory

Performance = Manager skill + Match quality + Noise

Evidence

- Within-firm variance $<$ across-firm variance
- Correlation breaks down at extremes
- Some CEO-firm pairs negative value

Implication

One-size-fits-all CEO market unrealistic

Implications

For Empirical Research

Don't Use Raw Manager FE

- 78% noise $\rightarrow$ severe attenuation bias
- Correlations misleading
- Fixed effects are not causal effects

Better Practices

1. Include observable characteristics
2. Use cohort or group effects
3. CEO effects on LHS only
4. Always consider placebos

For Theory

Models Need Noise

- Pure sorting models predict too much
- Need measurement error or match quality
- Time-varying skills important

Decreasing Returns Matter

- Span of control limits CEO impact
- Complementarity with firm assets
- Not just additive effects

For Policy

Executive Compensation

- Pay-performance sensitivity overstated?
- Most "performance" not from CEO
- Rethink optimal contracts

Corporate Governance

- Board oversight less critical?
- Owner-managers not that different
- Focus on selection not monitoring

For Practice

CEO Selection

- Observable characteristics matter
- Track record partially informative
- Industry experience valuable

Private Equity

- CEO replacement effects modest
- Operational improvements $>$ CEO changes
- Manage expectations

Comparison with Literature

Study	Setting	Method	Effect
Bertrand & Schoar (2003)	US public	FE	4pp ROA
Bennedsen et al (2020)	Danish private	Hospitalization	-7%
Bandiera et al (2020)	6 countries	Time use	+8%
This paper	Hungarian private	Placebo	**+5.5%**

We find smaller but more credible effects

External Validity

Generalizable

- Broad economy coverage
- Standard production technology
- Similar to other EU countries

Context-Specific

- Transition economy history
- Specific labor market institutions
- Private firm focus

Key Insight

Noise problem likely universal

Conclusion

What We Did

1. **Modeled** CEO value in private firms
2. **Measured** using universe of Hungarian firms
3. **Developed** placebo-controlled method
4. **Found** 78% of "effects" are spurious

What We Found

Main Result

True CEO effect = 5.5%, not 25%

Why the Difference?

- Endogenous timing
- Selection effects
- Spurious correlations

Still Meaningful

5.5% productivity gain substantial

What We Learned

Methodological

- Standard FE approaches overstate
- Placebo controls essential
- Observable characteristics help

Economic

- CEOs matter but less than thought
- Firm fundamentals dominate
- Match quality important

Implications Going Forward

For Researchers

- Reconsider manager FE papers
- Implement placebo checks
- Focus on identification

For Policymakers

- Moderate CEO compensation debates
- Governance reforms less urgent
- Focus on firm fundamentals

For Practitioners

- CEO changes not magic bullets
- Selection matters but has limits
- Manage stakeholder expectations

Next Steps

Extensions

- Dynamic effects over CEO tenure
- Team production and complementarities
- International comparison

Applications

- Other management practices
- Board effects
- Family succession

Thank You

Contact: korenm@ceu.edu

Paper: github.com/korenmiklos/ceo-value

Data: Available through KRTK Adatbank

Funding: - ERC Advanced Grant 101097789 - Hungarian NKFI KKP_22 144193

Appendix

Data Construction Details

Sample Filters

1. Years 1992-2022 only
2. Non-missing revenue and employment
3. Single CEO at any point
4. Exclude financial sector
5. Trim 1% tails of growth rates

Variable Definitions

- Revenue: Total sales excluding VAT
- Employment: Average annual employees
- Manager skill: CEO fixed effect from residualized surplus
- Foreign: $>50\%$ foreign ownership
- State: $>50\%$ state ownership

Econometric Details

Revenue Function Estimation

1. Assume Cobb-Douglas technology
2. Impose constant returns on variable inputs
3. Estimate with firm and year FE
4. Cluster SE at firm level

Manager Skill Estimation

1. Residualize surplus from revenue function
2. Estimate CEO fixed effects
3. Normalize mean to zero
4. Shrinkage for small samples

Additional Robustness

Alternative Surplus Measures

- EBITDA instead of revenue
- Value added
- TFP from production function

All give similar results

Alternative Samples

- Balanced panel
- Long-tenure CEOs only
- Exclude crisis years

Results robust

Placebo Algorithm Details

```
For each firm i:
  1. Calculate P(CEO change)
  2. Draw random years with probability P
  3. Exclude window around actual changes
  4. Assign placebo "quality" randomly
  5. Run same event study
```

Theory Appendix

Microfoundations

Full derivation available in paper

Key Assumptions

1. Cobb-Douglas technology
2. Perfect competition in inputs
3. Sector-specific output prices
4. Managers maximize short-run profit

Testable Predictions

1. $\alpha + \beta + \gamma < 1$
2. Revenue shares constant
3. Manager effects proportional to $1/\chi$