Firm Decentralization and Long-Run Growth

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Introduction

- Do decision rights matter within a firm?
  - Longstanding debate over centralization vs decentralization of local decisions
  - Especially relevant given increasing consolidation of megafirms (Autor et al., 2020)

Introduction

- Do decision rights matter within a firm?
- Our research question: what are the long-run effects of decentralization within a firm?
  - Assemble comprehensive data on decentralization and long-run firm outcomes
  - Address endogeneity of decentralization using two complementary IV strategies

Introduction

- Do decision rights matter within a firm?
- Our research question: what are the long-run effects of decentralization within a firm?
  - Assemble comprehensive data on decentralization and long-run firm outcomes
  - Address endogeneity of decentralization using two complementary IV strategies
- Findings:
  - Plants with greater autonomy from headquarters experience faster growth over 15 years
  - Baseline relationships are consistent with causal effects
  - Consistent with (inefficient) preferences for control by HQ

Project overview

- Two complementary datasets
  - MOPS + firm outcomes from U.S. Census Bureau
    - ★ Questionnaire responses on decentralization from MOPS
    - ★ Establishment-level outcomes and ownership histories from CMF and LBD
  - WMS + accounting data from BvD
    - ★ Covers 18 countries
    - ★ Structured interview ratings from WMS
    - ★ Firm-level accounts outcomes from BvD
- Empirical approaches
- Main results
- Two proposed mechanisms

Project overview

- Two complementary datasets
- Empirical approaches
  - OLS approach: compare long-run establishment growth rates by baseline decentralization
  - IV strategy 1: exploit differences in the past ownership histories of acquired plants
  - IV strategy 2: exploit differential likelihood of Anglo-Saxon countries in following U.S. industry decentralization
- Main results
- Two proposed mechanisms

Project overview

- Two complementary datasets
- Empirical approaches
- Main results
  - Robust OLS relationship between baseline decentralization and subsequent establishment sales, value-added, employment[, and labor productivity] growth
  - IV estimates confirm positive effects of decentralization on output and labor productivity
  - WMS results broadly consistent with U.S. results
- Two proposed mechanisms

Project overview

- Two complementary datasets

- Empirical approaches

- Main results

- Two proposed mechanisms
  - How? Decentralized plants are better able to capture long-run market growth
  - Why? Owners trade-off benefits of growth with preferences for control

Literature

- Theory
  - Examples: Lange (1936); Hayek (1945); Fayol (2016); Drucker (1993); Aghion and Tirole (1997); Dessein (2002); Hart and Moore (2005); Gibbons and Roberts (2012); Aghion et al. (2014); Garicano and Rayo (2016)
- Determinants of decentralization
- Effects of decentralization on outcomes

Literature

- Theory
- Determinants of decentralization
    - Examples: Caroli and Van Reenen (2001); Bresnahan et al. (2002); Rajan and Wulf (2006); Acemoglu et al. (2007); Guadalupe and Wulf (2010); McElheran (2014); Dessein et al. (2019)
    - Contributions:
        - Document role of organizational persistence
        - Supports the role of local information, preferences for control
- Effects of decentralization on outcomes

Literature

- Theory
- Determinants of decentralization
  - Contributions:
    - ★ Document role of organizational persistence
    - ★ Supports the role of local information, preferences for control
- Effects of decentralization on outcomes
  - Within government RCTs: Duflo et al. (2018); Bandiera et al. (2020); Balán et al. (2022)
  - Firms: Bradley et al. (2011); Kala (2019); Aghion et al. (2021)
  - Contribution:
    - ★ Focus on private sector firms in developed countries
    - ★ Systematic data on long-run growth
    - ★ Novel sources of external variation

Census Data

- Direct measures of decentralization from Management and Organizational Practices Survey (MOPS)
  - Conducted by Census Bureau as a supplement to the Annual Survey of Manufactures (ASM)
  - High-quality sampling frame, high response rates
  - Use 2010 and 2015 waves to cover firm practices and organization in 2005, 2010, and 2015
- Plant outcomes
  - Measure plant outcomes between 2002 and 2017 from the Census of Manufactures (CMF)
  - Focal outcomes: sales, value-added, and employment
  - Additional data on ownership history, survival since 1982 from Longitudinal Business Database (LBD)

Measuring decentralization — 6 questions

- Six questions on decentralization *from HQ to plant*:
  - ▸ Where were decisions on hiring permanent full-time employees made?
  - ▸ Where were decisions to give an employee a pay increase of at least 10% made?
  - ▸ Where were decisions on new product introductions made?
  - ▸ Where were product pricing decisions made?
  - ▸ Where were advertising decisions for products made?
  - ▸ What was the dollar amount that could be used to purchase a fixed/capital asset at this establishment without prior authorization from headquarters?
- Defining decentralization index:

Measuring decentralization — 6 questions

- Six questions on decentralization *from HQ to plant*:
- Defining decentralization index:
  - Map response to each component q to linear index $D_{iq} \in [0,1]$
  - Baseline decentralization measure $\text{DEC}_i = E_q[D_{iq}]$
  - Interpretation: share of decisions made at plant-level
  - Robust to alternative measures (z-scores, binary)

Decentralized plants in the U.S. grew faster between 2002 and 2017
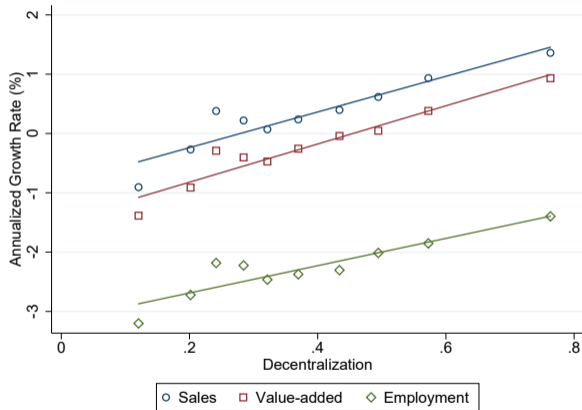
Most plants are relatively centralized

Slope of sales and VA (3.0 and 3.2) exceeds employment (2.3)

Baseline OLS approach

To assess simultaneity, we isolate the *baseline* level of decentralization and control for common trends:

$$\Delta Y_{i,2002-17} = \mu \text{DEC}_{i,2005} + \gamma_n + \Theta X_{i,2002} + \Delta \varepsilon_i,$$

Details:

- For size outcomes, accommodate exits with $\Delta Y_{i,2002-17} = \frac{Y_{i,2017} - Y_{i,2002}}{(Y_{i,2017} + Y_{i,2002})/2}/15$
- For labor productivity, restrict to survivors and use
  $\Delta Y_{i,2002-17} = (\log(Y_{i,2017}) - \log(Y_{i,2002}))/15$
- Always allow for NAICS4 trends by including γ_n fixed effects
- Baseline controls: log plant employment and payroll
- Robustness controls: structured management, firm size & age, share of firm sales

Baseline decentralization predicts subsequent plant size growth

	Long Differences (DHS), 2002-17			
	(1)	(2)	(3)	(4)
	A: Sales			
Decentralization	2.322***	2.256***	2.282***	2.191***
	(0.438)	(0.439)	(0.437)	(0.442)
	B: Employment			
Decentralization	1.669***	1.594***	1.620***	1.471***
	(0.368)	(0.367)	(0.366)	(0.369)
# Est.	7300	7300	7300	7300
# Firms	3400	3400	3400	3400
Controls:				
Baseline est. size		Y	Y	Y
Management			Y	Y
Baseline firm chars.				Y

SD of $DEC_i \approx .20$ implies baseline effect of 0.44 p.p.

Employment effect is approx 2/3 of sales effect

Approx 42% of effect on sales growth is driven by reduced exit

Baseline decentralization predicts subsequent plant labor productivity growth

|	Long Differences (Log), 2002-17			
	(1)	(2)	(3)	(4)
	A: Sales per worker			
Decentralization	0.413*	0.457*	0.453*	0.538**
	(0.249)	(0.245)	(0.245)	(0.248)
	B: Value-added per worker			
Decentralization	0.419	0.489	0.487	0.572*
	(0.321)	(0.320)	(0.320)	(0.322)
# Est.	6100	6100	6100	6100
# Firms	3000	3000	3000	3000
Controls:				
Baseline est. size		Y	Y	Y
Management			Y	Y
Baseline firm chars.				Y

CMF "survivors" 84% of baseline sample

VA results similar to sales but noisier

IV strategy 1: donor firms

To address remaining concerns about endogeneity, we isolate an additional source of pre-2002 variation in two steps:

1. Identify acquired plants using firm and longitudinal plant IDs in LBD data:
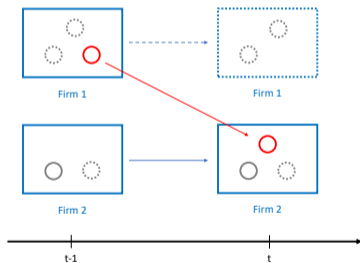
IV strategy 1: donor firms

To address remaining concerns about endogeneity, we isolate an additional source of pre-2002 variation in two steps:

1. Identify acquired plants using firm and longitudinal plant IDs in LBD data:
2. Exploit differences *between acquired plants* in the decentralization propensity of the original "donor firm" and assume:

$$
E\left[\Delta \varepsilon_{i,2002-17} | \underbrace{\overline{DEC}_{J(i,1982)}}_{\text{donor firm}}, \underbrace{L_{i,1982}, W_{i,1982}, \gamma_n}_{\text{estab. controls}}\right] = 0
$$

IV strategy 1: details

To implement our IV strategy, we identify all plants that

- Was acquired by another firm at some point between 1982 and 2002
- Was covered by at least one wave of the MOPS

We proxy for historic decentralization propensity using the firm's size in 1982 and estimate the following system of equations by 2SLS:

$$DEC_i = \pi Z_{j',1982} + \Lambda X_{i,1982} + \psi_n + v_i$$

$$\Delta Y_{i,2002-17} = \beta DEC_i + \Theta X_{i,1982} + \gamma_n + \Delta \varepsilon_{i,2002-17}$$

Pre-merger firm characteristics predict subsequent decentralization

Dep. Variable	Average Decentralization			
	(1)	(2)	(3)	(4)
Orig. firm size	-0.00795***	-0.00988***	-0.00998***	-0.00938***
	(0.00122)	(0.00135)	(0.00135)	(0.00141)
# Est.	4400	4400	4400	4400
# Firms	1600	1600	1600	1600
Controls:				
Orig. est. size		Y	Y	Y
Management			Y	Y
Baseline firm chars.				Y

Sample size is around 60% of baseline OLS regressions

SD of orig. firm employment ≈ 2.4 translates to a .024 effect on plant decentralization

Causal impacts of decentralization on plant size growth

	Long Differences (DHS), 2002-17			
	(1)	(2)	(3)	(4)
	A: Sales			
Decentralization	23.89***	15.70***	16.95***	13.67**
	(6.130)	(5.304)	(5.268)	(5.496)
	B: Employment			
Decentralization	11.67***	2.013	3.162	-0.154
	(4.495)	(4.092)	(4.030)	(4.387)
# Est.	4400	4400	4400	4400
# Firms	1600	1600	1600	1600
First stage F	42.4	53.9	54.6	44.2
Controls:				
Orig. est. size		Y	Y	Y
Management			Y	Y
Baseline firm chars.				Y

Establishment controls important for isolating firm-level variation

Larger magnitudes vs OLS likely mainly driven by difference in "compliers"

# Causal impacts of decentralization on plant labor productivity growth

	Long Differences (Log), 2002-17			
	(1)	(2)	(3)	(4)
	A: Sales per worker			
Decentralization	13.72***	16.23***	16.23***	16.61***
	(3.772)	(3.780)	(3.762)	(4.113)
	B: Value-added per worker			
Decentralization	15.32***	13.61***	13.63***	13.78***
	(5.074)	(4.755)	(4.720)	(5.117)
# Est.	3700	3700	3700	3700
# Firms	1400	1400	1400	1400
First stage F	35.9	48	48.4	38.4
Controls:				
Orig. est. size		Y	Y	Y
Management			Y	Y
Baseline firm chars.				Y

1 s.d. increase in *persistent* decentralization leads to a 2.7 p.p. increase in annual sales/worker growth

IV strategy 1: placebo

The primary threat to our IV strategy is that other organizational characteristics may also inherited and affect future plant growth. As a placebo,

1. Isolate a similar set of plants that switched owners but became *single units*:
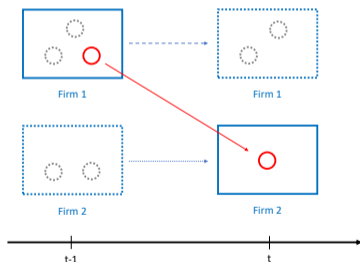
IV strategy 1: placebo

The primary threat to our IV strategy is that other organizational characteristics may also inherited and affect future plant growth. As a placebo,

1. Isolate a similar set of plants that switched owners but became *single units*:
2. Estimate the reduced form equation implied by the IV strategy:

$$\Delta Y_{i,2002-17} = \beta \pi Z_{j',1982} + \Theta X_{i,1982} + \gamma_n + \Delta \varepsilon_{i,2002-17}$$

Historic donor firm size does not predict future growth for single-unit establishments

	Long Differences, 2002-17				
	(1)	(2)	(3)	(4)	(5)
Orig. firm size	-0.0672	0.00945	-0.0595	-0.0114	0.151
	(0.116)	(0.119)	(0.0969)	(0.0773)	(0.0930)
# Est.	9000	9000	9000	3600	3600
# Firms	9000	9000	9000	3600	3600
Outcome	Sales	VA	Emp	Sales/Emp	VA/Emp
Controls:					
Orig. est. size	Y	Y	Y	Y	Y

Negative first stage
$\implies$ "wrong-sign" for
VA, VA/emp

External validity: similar growth-decentralization relationship from WMS
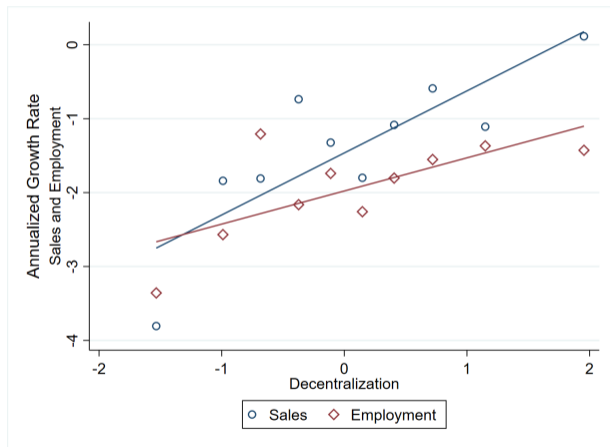
Stacked 6-year differences across all waves of WMS

Decentralization z-score (following prior work)

Baseline decentralization predicts subsequent plant size growth in WMS

	6-year Long Differences (Log)			
	(1)	(2)	(3)	(4)
	A. Sales			
Decentralization	0.633***	0.621***	0.657***	0.705***
	(0.198)	(0.199)	(0.204)	(0.203)
Observations	9,155	9,155	9,155	9,155
	B. Employment			
Decentralization	0.421**	0.399*	0.377*	0.424*
	(0.213)	(0.216)	(0.224)	(0.227)
Observations	9,224	9,224	9,224	9,224
Controls:				
Initial size		Y	Y	Y
Management control			Y	Y
Extended controls				Y

MOPS magnitudes comparable (.44 for sales and .32 for employment)

IV strategy 2: decentralization in Anglo-Saxon countries follow US norms

Method	(1) OLS	(2) First Stage	(3) 2SLS
	A. Sales		
Decentralization	0.997** (0.384)		3.865* (2.037)
US industry Decentralization		0.198** (0.075)	
Observations	1,576	1,576	1,576
	B. Employment		
Decentralization	0.743** (0.313)		5.408** (2.264)
US industry Decentralization		0.186** (0.071)	
Observations	1,591	1,591	1,591

Industry decentralization in non-Anglo countries is uncorrelated with the U.S. ("culture" rather than technology)

Taking stock

We've found that decentralization robustly increases plant (or firm) growth across a variety of contexts.

Notably, this is *within* private (and presumably optimizing) firms and over a sustained period.

1. Why are decentralized plants able to be *persistently* faster growing?
   - Consider long-run version of Aghion et al. (2021) by allowing relationship to differ by industry demand growth (between $2002 - 2017$):

$$\Delta \text{Shock}_{n,2002-17} = \frac{X_{n,2002}}{Y_{n,2002}} \times \sum_{j,c} \left(\frac{X_{njc,2002}}{X_{n,2002}} \times \Delta M_{jc,2002-17} \right)$$

2. Why are most plants still relatively centralized?

Taking stock

We've found that decentralization robustly increases plant (or firm) growth across a variety of contexts.

Notably, this is *within* private (and presumably optimizing) firms and over a sustained period.

1. Why are decentralized plants able to be *persistently* faster growing?
2. Why are most plants still relatively centralized?
   - Allow differential effects at plants in mature firms that are *still founder-operated*
   - Literature suggests that HQ control here may be less appropriate (Jayaraman et al., 2000; Wasserman, 2003; Lee et al., 2017) but particularly valuable (Fehr et al., 2013)

Decentralized plants can capture sustained industry growth

	Long Differences (DHS), 2002-17			
	(1)	(2)	(3)	(4)
	A: Sales			
Shock × decen.	4.427***	4.315***	4.021**	3.678**
	(1.593)	(1.588)	(1.573)	(1.548)
Shock	-0.841	-0.691	-0.653	-0.556
	(0.840)	(0.834)	(0.822)	(0.812)
# Est.	17500	17500	17500	17500
# Firms	6700	6700	6700	6700
Controls:				
Baseline est. size		Y	Y	Y
Management			Y	Y
Baseline firm chars.				Y

Growth rate of centralized plants are uncorrelated with *long-run* differences in industry export demand

Complementary to prior evidence on resilience during downturns (Aghion et al., 2021)

Decentralized plants perform better under "excessive" control

	6-year Long Differences (Log)			
	(1)	(2)	(3)	(4)
	A. Sales			
Old Founder × Decentralization	2.253***	2.297***	2.248***	2.279***
	(0.830)	(0.826)	(0.826)	(0.809)
Decentralization	0.445**	0.429**	0.465**	0.511**
	(0.193)	(0.194)	(0.198)	(0.198)
Observations	8,887	8,887	8,887	8,887
Controls:				
Initial size		Y	Y	Y
Management control			Y	Y
Extended controls				Y

Decentralization-growth relationship amplified at founder-controlled firms that are over 10 years old

Conclusion

- We compile comprehensive data linking direct measures of decentralization to long-run plant outcomes
- We find consistent evidence that the relationship between decentralization and growth is robust and causal
  - In the U.S. between 2002 – 2017
  - Across the WMS countries over repeated 6-year intervals
- We highlight two factors that help explain our results:
  - Decentralized plants seem more able to respond to sustained changes in market conditions
  - HQs may have preferences for control in addition to growth

Thank you!

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