

# **International Trade and Capital Allocation within Firms**

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# The Trade-View of Multi-Product Firms

Multi-product firms are more productive compared to single product firms (Schoar 2002)

and

they dominate in international trade. They account for 60% of exporters, 98% of export value and 98% of US manufacturing sales (Bernard et al 2007, 2010).

# The Finance View of Conglomerates

Conglomerates trade at a discount, „conglomerate discount“, they have lower Tobin's q compared to single segment firms (Lang and Stulz (1994), Shin and Stulz (1998), Ozbas and Scharfstein (2010)).

Internal capital markets lead to misallocations of capital across divisions of the firm

# Question

How can we reconcile the productivity enhancing view of multi-product firms of the trade literature

with

the efficiency destroying view of conglomerates of the finance literature?

# **Motivating Facts**

# Data

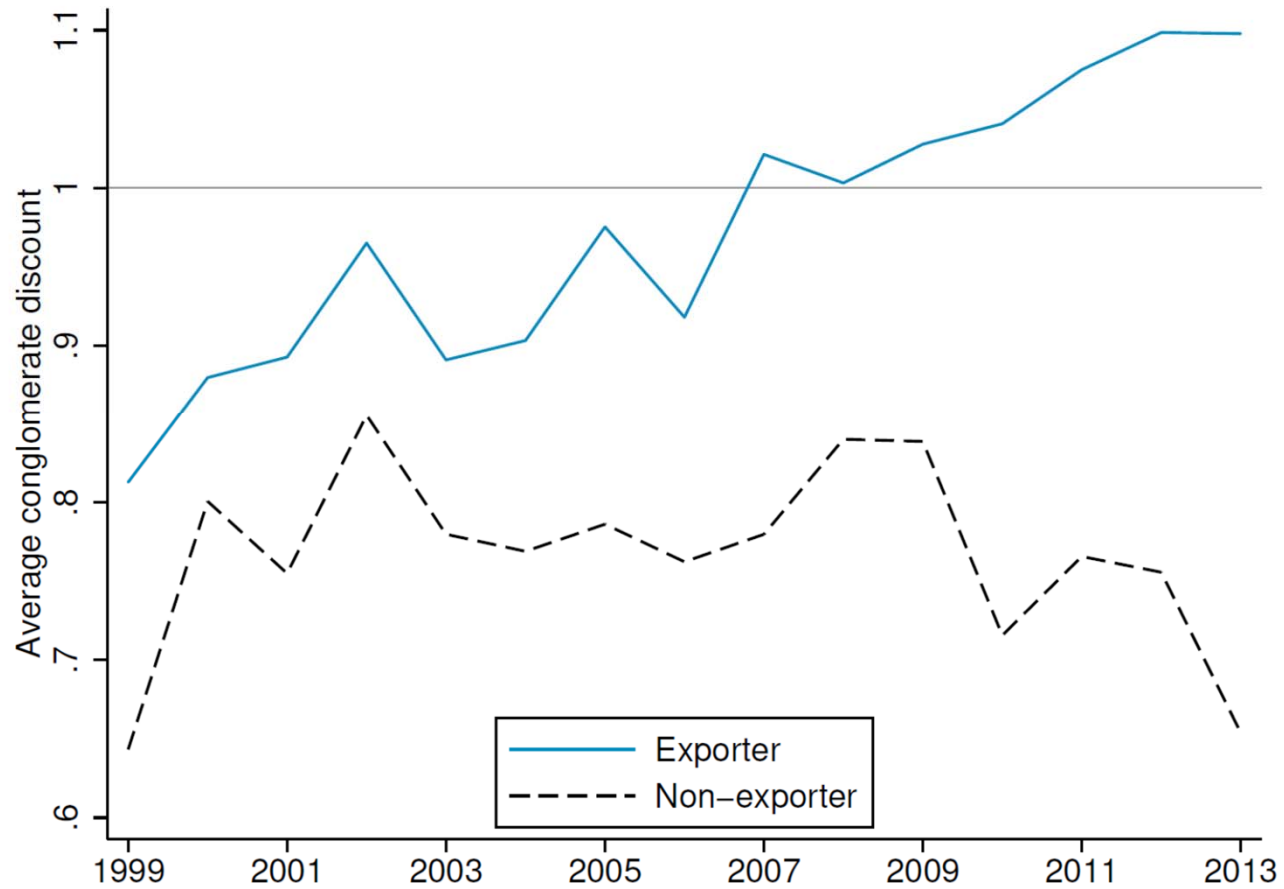
Firm level data of publicly listed US firms in the manufacturing sector in 1997-2014 from [Worldscope](#),

includes balance sheet information and accounting information on SIC4-digit level business segments

[3341 firms with 1089 exporters, 586 non-exporting firms, and 714 multi-segment firms](#)

# Exporters have lower conglomerate discount

T's q of multi-segment firms/single-segment firms



## 3 Observations

**Fact 1:** Multi-segment firms have lower Tobin's  $q$  than single-segment firms (relative  $q$  is below unity).

**Fact 2:** The conglomerate discount is smaller for exporting firms (blue is above dashed curve)

**Fact 3:** After 2007/2008 the discount turns into a premium for exporters (the ratio surpasses 1)



# Question

Why do firms

exposed to international trade

suffer from

a smaller conglomerate discount?

# Our Contribution

We introduce an **internal capital market** in which managers compete for funds into a **two-factor model of multi-product firms** with monopolistic competition to explain which products firms finance and produce.

We **microfound** the theory of multi-product firms in a **finance theory of organization**

# Our Findings

- Conglomerates trade at a discount because the internal competition for funds (internal capital market) **over-allocates** capital to the **best segments of the firm**
- International trade **imposes discipline** on competition for capital within firms, thus improving the efficiency of internal capital markets. This explains why **the conglomerate discount is smaller for trading firms.**
- Using **China's entry** to the WTO as a **natural experiment** we show that import competition improves the within firm mis-allocation of capital in publicly listed US firms.

# Contribution to Corporate Finance

Stein 1997: **Efficient internal capital markets**, picking winners, funds go to the **most productive projects**.

Rajan et al 2000, Scharfstein and Stein 2000: **Inefficient internal capital markets**, funds go to the **weakest segments** at the expense of the good segments, **corporate socialism**.

Our model incorporates both features and explains why the recent finance literature finds **mixed empirical evidence** on the efficiency of internal capital markets (Maksimovic and Philips 2013)

# Contribution to Mis-allocation

Differences in the efficiency of capital allocation in a sector – mis-allocation between firms - explain differences in TFP across countries, Hsie and Klenow (2009), Gopinath et al (2017)

Kehrig and Vincent (2017) show that two thirds of the mis-allocation of capital originates within firms rather than between firms

We offer a novel theory of mis-allocation within firms which we show is reduced by more international competition

# A Two Factor Model of Multi-Product Firms

A trade model with heterogenous multi-product firms with monopolistic competition along Mayer, Melitz, and Ottaviano (2014)

New elements

- **capital** as a second factor of production
- there is **asymmetric information** between the owner of a firm (who allocates capital) and divisions managers
- managers **compete** for capital

# Taking a Look ...

inside

each of these multi-product firms

consisting of an **owner** and **divisional managers** running the division of each of the firm's product

## Internal Capital Market:

Informational frictions: The firm cannot verify the true cost of a non-core division  $x_i$  in the firm, this is private knowledge of the division manager only

Empire building managers strategically overreport the true cost of their division  $z_i = \mu_i x_i$  to maximize their private benefit from running bigger divisions

Winner picking firms rank managers by division's return on investment  $roa(z_i c)$



# Empire Building Managers

Actual production is not verifiable by the firm, only the amount of output sold on the market  $q(z_i, c)$ .

Managers receive a private benefit from producing more than is sold on the market

$$\tilde{y}(i; c) - q(z_i, c)$$

$$b(\mu; x_i, c) = \frac{c_D L}{2\gamma} (\mu - 1) \left( 1 - \frac{\mu x_i c}{c_D} \right)$$

$\tilde{y}(i; c)$  is the output of a division with customization cost  $x_i$  which is financed with  $k(z_i, c)$  units of capital

# Competition for Funding

The firm opens a tournament among candidate managers for running non-core divisions.

Managers announce their customization costs  $z_i = \mu x_i$  simultaneously and without coordination

The firm ranks managers by return on assets given the announced costs  $roa(z_i c)$

Managers know the core competence costs of a firm  $c$ , the market cutoff  $c_D$  and the number of divisions  $m$  a firm is opening

Managers choose the factor of mis-reporting which maximizes the expected private benefit

$$\mu_i^* = \arg \max_{\mu \in [\underline{\mu}_i, \bar{\mu}_i]} \psi_i(\mu) b(\mu; x_i, c)$$

# Strategic Over-Reporting

**Proposition.** A solution  $\mu_i^*(x_i, c, c_D, \theta)$  to the manager's problem does exist and is unique. Only managers with products that are good enough  $x_i < \frac{c_D/c}{1 + 2\theta^2/\varphi_k}$  apply for funds and they over-report the customization cost  $\mu_i^*(x_i, c, c_D, \theta) > 1$ .

The comparative statics of managers' decision are:

(1.1)  $\mu_i^*$  is decreasing in  $x_i$

(1.2)  $\mu_i^*$  is decreasing in  $c$

(1.3)  $\mu_i^*$  is increasing in  $c_D$

(1.4)  $\mu_i^*$  is increasing in the number of non-core divisions  $m$

## Intuition 1:

$\mu_i^*$  is decreasing in  $x_i$  and  $c$

Over-reporting is larger the lower the marginal costs.

Only managers with relatively good products have the room for over-reporting their costs and still face a positive probability of being financed.

## Intuition 2:

$\mu_i^*$  is increasing in  $c_D$

Over-reporting is lower the tougher is competition in the output market.

Trade acts a disciplining device on the competition for capital within multi-segment firms.

Tougher competition lowers the cost level at which firms can survive in the market  $c_D$ . Managers use the cut-off cost level  $c_D$  as a benchmark when they decide how much to deviate from the true costs.

## Intuition 3:

$\mu_i^*$  is larger in firms with more divisions  $m$

When more slots are to be filled in a firm, it is more likely that the manager's offer will be in the range of selected offers.

Managers do not care about the position they are ranked in the tournament. They only care to be in the pool of offers to be financed.

Managers have less of an incentive to make a lower offer of  $\mu_i^*$

**Taking the theory to the data**

# Inversely U-shaped Capital Allocation

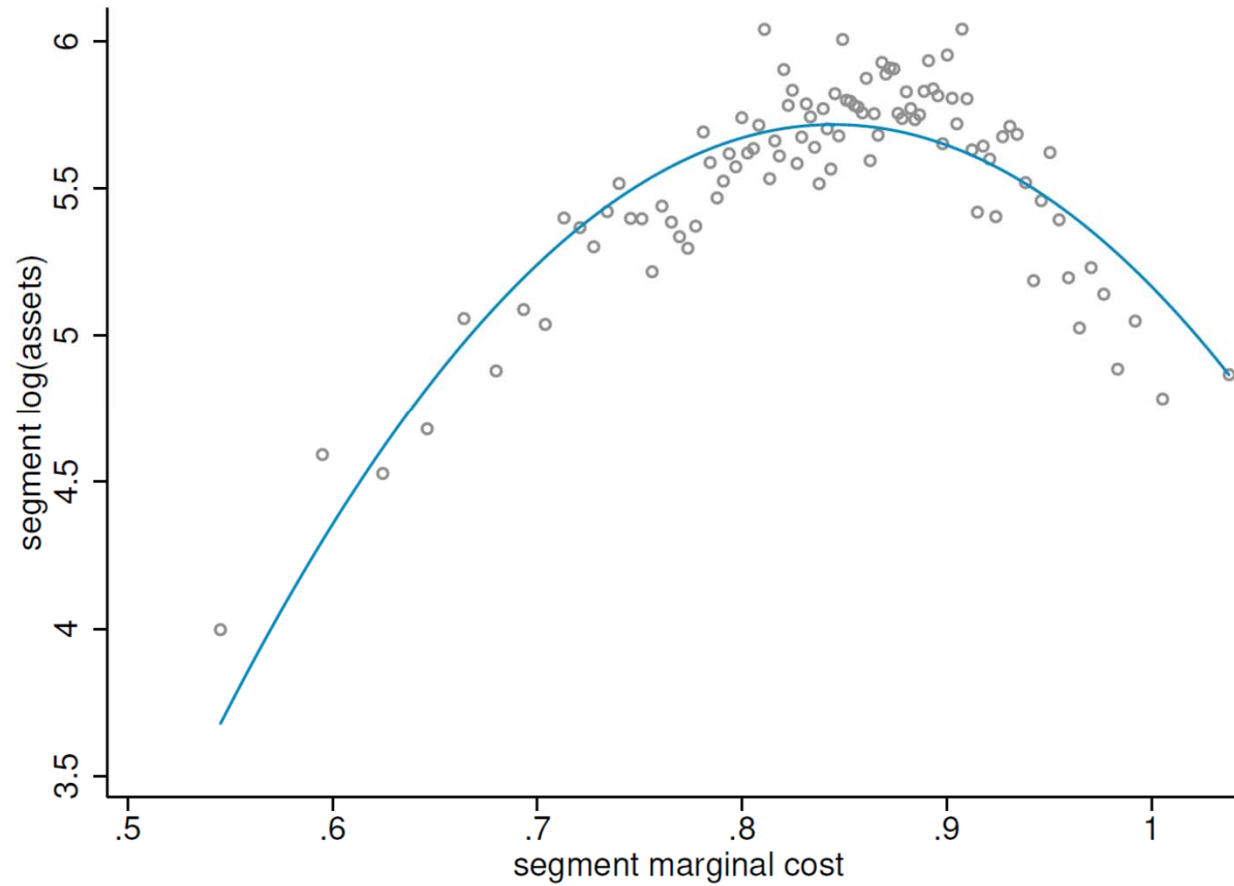
**Prediction 2:** The relationship between the marginal costs of a segment and the allocation of capital is **inversely u-shaped**

Two opposing forces

- segments with larger marginal costs require more capital (technology effect) and managers over-report the costs (over-reporting effect)
- segments with larger marginal costs charge larger prices and face less demand (demand effect) and over-reporting declines due to a lower probability of funding.



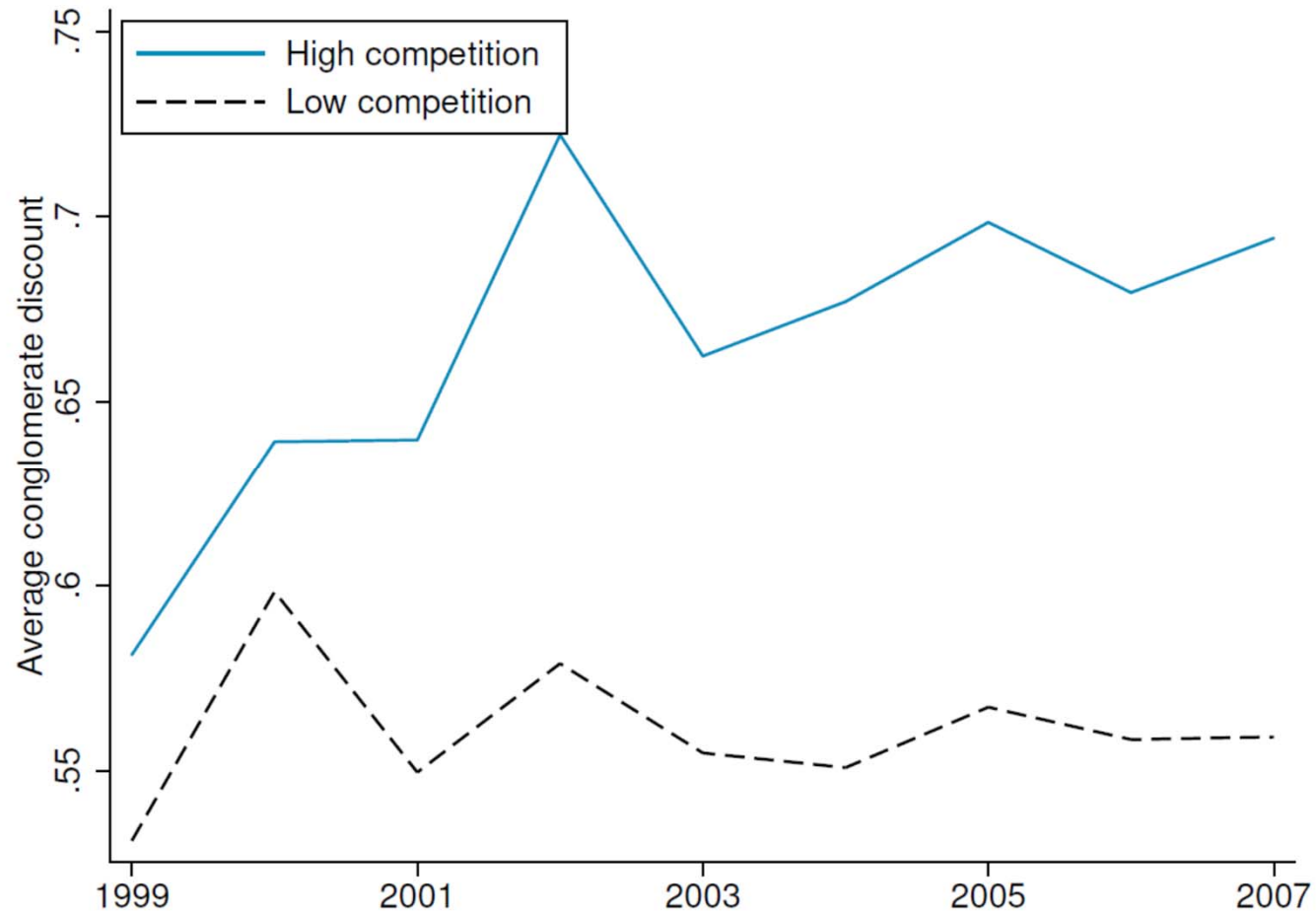
# Capital Allocation across Segments



**The „China Shock“  
and within-firm Mis-allocation:**

**A non-parametric test  
of the disciplining effect of China**

# Conglomerate Discount and China Competition



# **Deriving Testable Implications**

# Asset Response to Competition

three effects:

$$\frac{d \ln(\text{assets}_{fit})}{d \ln c_{Dt}} = \underbrace{\frac{\partial \ln(\text{assets}_{fit})}{\partial \ln c_{Dt}}}_{\text{competitive effect}} - \underbrace{\frac{\partial \ln(\text{assets}_{fit})}{\partial \ln rmc_{fit}}}_{\text{reallocation effect}} + \underbrace{\frac{\partial \ln(\text{assets}_{fit})}{\partial \ln rmc_{fit}} \frac{d \ln \mu_{fit}}{d \ln c_{Dt}}}_{\text{over-reporting effect}}.$$

# Asset Response to Competition

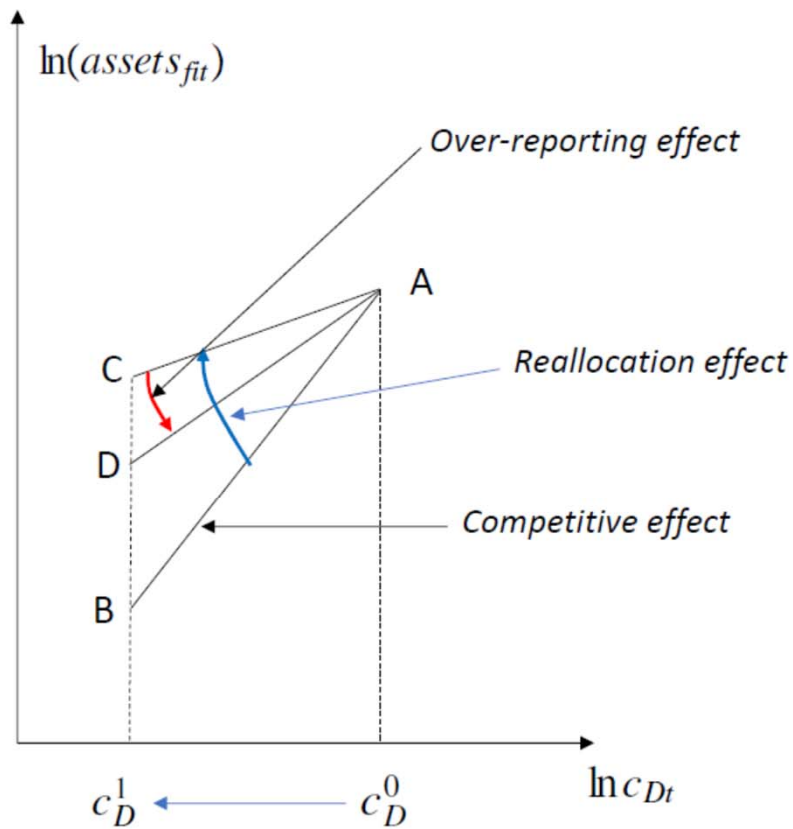
**Competitive effect:** As competition toughens, output and capital allocation declines proportionally in all segments.

**Reallocation effect:** As competition toughens a firm reallocates its assets away from inefficient to efficient segments.

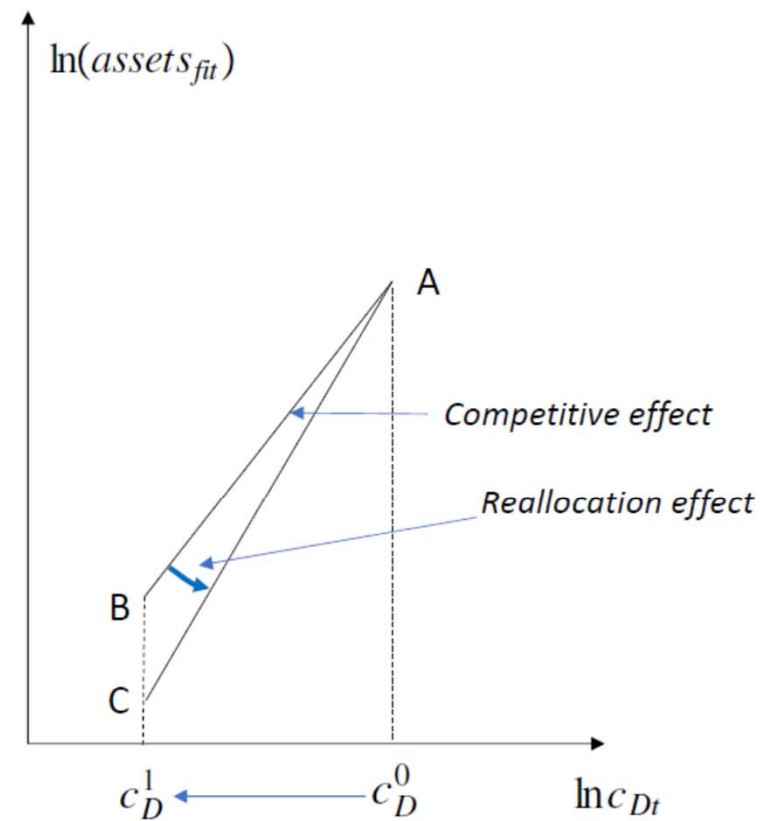
**Over-reporting effect:** As competition toughens over-reporting declines in efficient segments while there is no change in inefficient segments

# Asset Response to Competition Shock

Efficient segments



Inefficient segments





# Informational Frictions

The size of the over-reporting effect depends on the elasticity of over-reporting wrt to competition

$$\frac{d \ln \mu_{fit}}{d \ln c_{Dt}}$$

Managers will reduce over-reporting by less when competition toughens in firms with high frictions. Hence, the elasticity is likely to be lower in firms with high informational frictions

# The China Shock and Capital Mis- allocation

**Prediction 4:** An increase in import competition increases the relative allocation of capital to efficient segments and more so if informational frictions are high.

# Measuring Informational Frictions

Low tenure of the CEO in the board: less experienced CEO in the board are less informed about the firm, high friction

Busy directors: number of boards a CEO sits in, high friction

# Import competition and capital mis- allocation time on board

## Panel B: IV

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	IV	IV	IV	IV	IV	IV
		low friction	high friction		low friction	high friction
	$\Delta$ MC	$\Delta$ MC	$\Delta$ MC	$\Delta$ assets	$\Delta$ assets	$\Delta$ assets
efficient segments	-0.065 (0.042)	-0.072** (0.035)	-0.070 (0.077)	-0.027 (0.100)	0.170 (0.150)	-0.246* (0.130)
$\Delta$ China shock	0.011 (0.076)	0.138 (0.110)	-0.056 (0.120)	0.182 (0.322)	-0.456 (0.516)	0.091 (0.354)
efficient segments $\times$ $\Delta$ China shock	-0.416*** (0.119)	-0.345** (0.155)	-0.489** (0.204)	0.849* (0.466)	0.269 (0.711)	2.352*** (0.484)
Observations	344	170	174	344	170	174
R-squared	0.038	0.106	0.032	0.124	0.086	0.244

## Mis-allocation and Informational Frictions

**Prediction 3.1:** Multi-segment firms allocate more capital to their non-core segments than single segment firms with similar marginal costs.

**Prediction 3.2:** The degree to which multi-segment firms over-allocate capital to non-core segments, relative to single-segment firms with similar marginal costs, increases in informational asymmetries.

# Mis-allocation and informational frictions

VARIABLES	(1)	(2)	(3)	(4)
	log(assets)	log(assets)	low friction log(assets)	high friction log(assets)
multi-segment	1.118*** (0.320)	1.749*** (0.342)	0.935** (0.453)	2.251*** (0.470)
marginal costs	-0.224*** (0.082)	-0.364*** (0.101)	-0.029 (0.140)	-0.502*** (0.114)
multi-segment × marginal costs	0.377** (0.152)	0.687*** (0.160)	0.396* (0.215)	0.826*** (0.214)
Observations	21,083	21,082	11,319	9,757
R-squared	0.574	0.645	0.686	0.633
Industry FE	-	✓	✓	✓
Size FE	✓	✓	✓	✓

Note: Dependent variable is log assets at the segment-year level. *multi-segment* is a dummy with value one for multi-segment firms and zero for single-segment firms, *marginal costs* denotes relative marginal costs in a firm's core segment, measured as  $\ln(rmc_{if}^{core}(1 - rmc_{if}^{core}))$ . *low/high friction* refer to firms in which the time the average CEO sits on the board is above/below the sample median. All regressions control for firm size, investment, and efficiency. Standard errors are clustered on the firm level. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# Descriptive Statistics

	mean	sd	min	max	count
<i>Panel (a): Firm</i>					
Q	1.52	0.68	0.21	9.38	5909
mean(marginal costs)	0.17	0.09	0.00	1.00	5909
sd(marginal costs)	0.18	0.24	0.00	2.14	5909
number of segments	3.32	1.23	2.00	10.00	5909
assets	7354.83	36006.76	0.29	797769.00	5909
employment	14509.14	33380.04	2.00	364550.00	5858
investment ratio	0.04	0.03	0.00	0.35	5839
$\Delta Q$	-0.30	1.80	-8.31	7.14	665
multi-segment	0.46	0.50	0.00	1.00	665
<i>Panel (b): Segment</i>					
multi-segment	0.83	0.38	0.00	1.00	21083
log(assets)	5.58	2.15	-5.90	13.26	21083
return on assets	0.12	0.37	-3.67	2.47	21026
ln(rmc(1-rmc))	-1.96	0.42	-4.22	-1.39	21083
efficient segments	0.49	0.50	0.00	1.00	344
$\Delta$ assets	0.56	0.98	-2.57	3.44	344
$\Delta MC$	0.00	0.34	-1.15	3.48	344
<i>Panel (c): Industry</i>					
$\Delta$ China (1999-2007)	0.07	0.11	-0.00	0.70	126
$\Delta$ China IV (1999-2007)	0.05	0.09	-0.00	0.70	126

Note: This table shows descriptive statistics for main variables. Sample size varies due to different levels of analysis. In panel (a), the level of aggregation is the firm-year level, except for  $\Delta Q$  and *multi-segment* that are on the firm level. *mean marginal costs* is standardized to range from zero to one. In panel (b), the level of aggregation is the firm-segment-year level, except for *efficient segment*,  $\Delta assets$  and  $\Delta MC$  (marginal costs) that are on the firm-segment level. Panel (c) reports values on the industry level. Industry variables  $\Delta$  China are divided by 100 to improve readability of coefficients in regression tables.