INVESTMENT EFFICIENCY AND PRODUCT MARKET COMPETITION

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QUESTION

Information production is an inherent part of innovation

Information spillovers can be significant when the information pertains to overall market demand

Investment in information production activities is substantial

For efficient investment do we need existence of monopolies (so that there are rents to be had from doing the right thing)?

Or does the pressure of competition provide better incentives for firms?

JOSEPH SCHUMPETER

Creative Destruction

- "[What counts is] competition from the new commodity, the new technology, the new source of supply, the new type of organization ...competition which ...strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives."
- Capitalism, Socialism and Democracy (1942)

John Hicks

- "The best of all monopoly profits is a quiet life."

OUTLINE

Model

- Two-stage Bayesian game in differentiated products market competition
  - Firms collect information about common product demand in the first stage
  - Firms compete in a Cournot "oligopoly" in the second stage

Empirical Test

- Two part procedure
  - Investment inefficiency measure
  - Panel regression on competition
- Robustness

OUTCOMES

Theory

- Does competition lead to more investment efficiency?
  - No, investment efficiency increases with lower degrees of competition
    - Number of firms
    - Herfindahl-Hirschman
  - Larger firms are more efficient than smaller firms

Empirics

- Does the theory hold up?
  - Yes
- Are the results robust to endogeneity, alternative measures of investment efficiency, industry classifications, inclusion of non-public firms?
  - Yes
- Do alternative theories due to cash holdings, private information or agency costs do a better job of explanation?
  - No

LITERATURE

Innovation and competition

- Aghion and Howitt (1996)
- Aghion et al (2005)
- Stein (1997)
- Giroud and Müller (2010)
- Vives (2008)

Model

- Hwang (1993)
- Vives (1988)
- Gal-Or (1986)
- Darrough (1993)
- Richardson (2006)

Competition and performance

- Nickell (1996)
- Sundaram, John and John (1996)
- Hou and Robinson (2006)
- Giroud and Müller (2011)

MODEL

Second Stage

- n firms, each producing q_i at price p_i with inverse demand function where $0 \leq \gamma \leq \beta$
- $p_i = \alpha - \beta q_i - \gamma \sum_{j=1, j\neq i}^{n} q_j$
- Each firm faces a quadratic cost function
- $C_i(q_i) = c_i q_i^2$
- Cost coefficient decreasing with size
- N.B.: consistent approach derived from production function where investment monotonically increasing with cost expenditure

MODEL

First Stage

- Firms acquire information about the inverse demand intercept α
- Common prior: mean $\mu > 0$ and precision $h > 0$
- Private Signal: $s_i = \alpha + \epsilon_i$ where ϵ_i is independent of α and is distributed with a mean of zero and precision $t_i > 0$
- Precision costs λt_i; non monetary
- Posterior estimate is affine in s_i: $E(\alpha|s_i) = \mu + \delta_i(s_i - \mu)$, where $\delta_i = \frac{t_i}{t_i + h} > 0$

SECOND STAGE SOLUTION

- Given n-tuple of precision levels, $\boldsymbol{t} = (t_1, \ldots, t_n)$, Firm i chooses q_i to maximize its expected profit conditional on its private information, s_i
- $\max_{q_i} E\{[\alpha - \beta q_i - \gamma \sum_{j=1, j\neq i}^{n} q_j(s_j)]q_i - c_i q_i^2 | s_i\}$
- Forecasts other firms production levels based on own signal

SECOND STAGE SOLUTION

- Proposition 1:
- Given an n-tuple of precision levels, $\boldsymbol{t} = (t_1, \ldots, t_n)$, suppose the Bayesian-Cournot equilibrium output level of firm i conditional on the private signal, s_i, is given by $q_i^e(s_i) = a_i^e + b_i^e(\boldsymbol{t})\delta_i(s_i - \mu)$ for all $i = 1, \ldots, n$.
- Then the unique equilibrium is characterized by
  $a_i^e = \frac{\frac{\mu}{2\beta+2c_i-\gamma}}{1+\sum_{j=1}^{n}\frac{\gamma}{2\beta+2c_j-\gamma}}$ and $b_i^e = \frac{\frac{\delta_i}{2\beta+2c_i-\gamma\delta_i}}{1+\sum_{j=1}^{n}\frac{\gamma\delta_j}{2\beta+2c_j-\gamma\delta_j}}$
- Marginal impact of signal on output higher for larger firms
- Marginal impact of the signal is increasing in own precision and decreasing in rivals precision

FIRST STAGE SOLUTION

First Stage Solution

- In the first stage, firm i selects a precision level, t_i, to maximize its unconditional expected profits net of the effort cost of information production:
- $\max_{t_i} \pi_i(\boldsymbol{t}) - \lambda t_i$
- The perfect Bayesian equilibrium is a set of n simultaneous nonlinear equations.
- There exists an analytic solution in the duopoly case
- For the n-firm case, numerical analysis is required

INVESTMENT INEFFICIENCY

Investment inefficiency is the expectation of the proportional difference between the investment cost under incomplete information and that under full information

Note: in a model with capital formation, capital investment and output costs are monotonically related

By setting $\delta_i = 1$ and $s_i = \alpha$ for all $i = 1, \ldots, n$, we have

$$q_i^{FI}(\alpha) = \frac{\frac{\alpha}{2\beta + 2c_i - \gamma}}{1 + \sum_{j=1}^{n} \gamma/(2\beta + 2c_j - \gamma)}$$

Our definition of the ex-ante measure of investment efficiency is therefore given by

$$D_i = E\{\frac{C_i[q_i^*(s_i)] - C_i[q_i^{FI}(\alpha)]}{C_i[q_i^{FI}(\alpha)]}\} = E[\frac{q_i^*(s_i)^2 - q_i^{FI}(\alpha)^2}{q_i^{FI}(\alpha)^2}]$$

DUOPOLY ($n = 2$)

Proposition 2

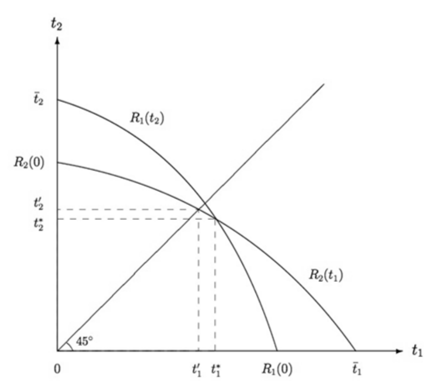
- Suppose that firm 1 is larger than firm 2 in that $c_1 < c_2$. If the marginal effort cost of information production, λ, is sufficiently small, there exists a unique perfect Bayesian equilibrium pair of precision levels, $\boldsymbol{t}^* = (t_1^*, t_2^*)$, in which

$$t_1^* = t_2^* \left(\frac{2\beta+2c_2-\gamma}{2\beta+2c_1-\gamma}\right)\sqrt{\left(\frac{\beta+c_1}{\beta+c_2}\right)} + \frac{2h\left(\sqrt{(\beta+c_1)(\beta+c_2)}-\beta-c_1\right)}{2\beta+2c_1-\gamma} > \; t_2^*$$

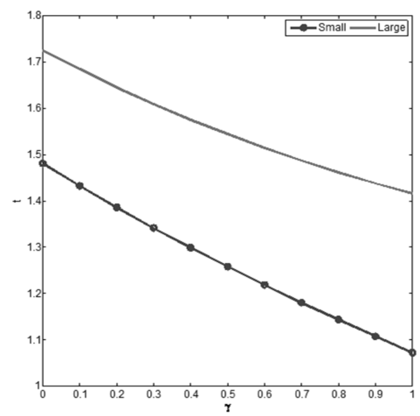
- Firm 1 acquires more information than firm 2. Furthermore, the ex-ante measures of investment inefficiency are positive, i.e., $D_i > 0$ for i=1 and 2, so that the two firms over-invest on average.

DUOPOLY

Figure 1: Perfect Bayesian equilibrium when firm 1 is larger than firm 2. $R_i(t_j)$ is the reaction function of firm i for $i = 1$ and 2, where $c_1 < c_2$. The intersection of the two reaction functions gives rise to the perfect Bayesian equilibrium pair of precision levels, (t_1^*, t_2^*), such that $t_1^* > t_2^*$.



DUOPOLY—COMPARATIVES (TWO FIRM CASE)



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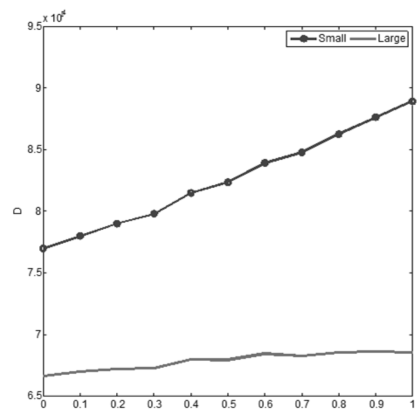
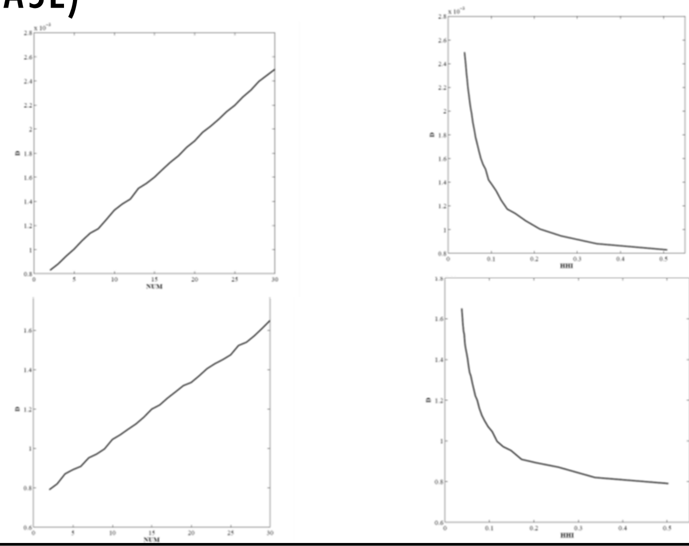
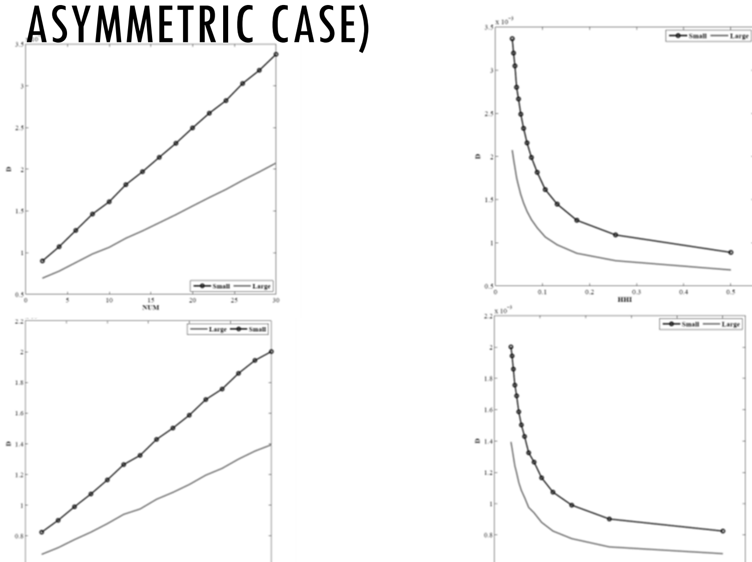


SIMULATION – OLIGOPOLY (SYMMETRIC CASE)



SIMULATION – OLIGOPOLY (n FIRMS ASYMMETRIC CASE)



THEORETICAL PREDICTIONS

H1: An increase in product market competitiveness, as measured by lower HHI or higher number of firms, decreases information acquisition by firms in the industry. As a result, the measure of investment inefficiency increases.

H2: Within an industry, large firms are less sensitive to investment inefficiencies and can benefit from competition when products are nearly perfect substitutes. Small firms are more sensitive to this effect and their information acquisition is monotonically decreasing with competition.

EMPIRICAL RESULTS

Data Sources

- COMPUSTAT, CRSP
- Tariff and freight cost data are obtained from Peter Schott's website

Time Period: 1980-2012

All listed firms, excluding financials and regulated utilities

EMPIRICAL RESULTS

Investment inefficiency calculated from the absolute value of the residual of the following first stage regression

- $I_{i,t} = \beta_1 \ V/P_{i,t-1} + \beta_2 \ Leverage_{i,t-1} + \beta_3 Cash_{i,t-1} + \beta_4 \ Size_{i,t-1} + \beta_5 \ Stock \ Return_{i,t-1} + \beta_6 \ Age_{i,t-1} + \beta_7 \ I_{i,t-1} + u_{i,t}$

Competition

- Herfindahl Index
- $HHI_j = \sum_{i=1}^{I} s_{ij}^2$

Firm Size

- Log of sales

ESTIMATED INVESTMENT REGRESSION

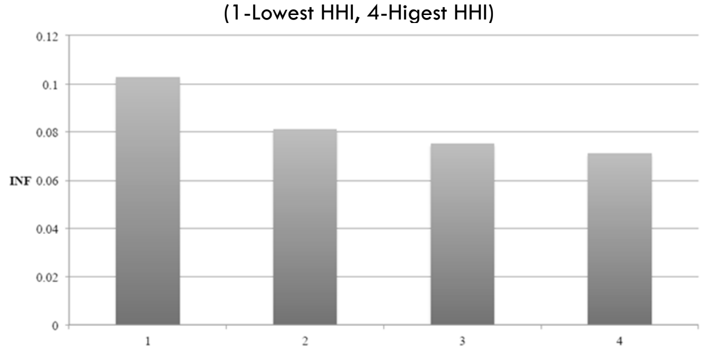
VARIABLES	$I_{i,t}$	$I_{i,t}$
VP	-0.058***	-0.031***
	(-15.93)	(-9.34)
LEVERAGE	-0.069***	-0.159***
	(-11.44)	(-15.10)
CASH	0.121***	0.059***
	(8.99)	(4.61)
SIZE	-0.003***	-0.062***
	(-3.19)	(-12.70)
RETURN	0.021***	0.019***
	(10.23)	(9.22)
AGE	-0.013***	-0.009
	(-4.82)	(-1.42)
$I_{i,t-1}$	0.123***	0.004
	(2.28)	(0.44)
Constant	0.160***	0.423***
	(15.99)	(19.43)
Industry-Fixed Effect	No	Yes
Year-Fixed Effect	No	Yes
Observations	60,202	60,202
Adjusted R^2	0.096	0.279

EMPIRICAL RESULTS

Mean of Investment inefficiency across Time

EMPIRICAL RESULTS

Mean of Investment inefficiency across HHI Group
(1-Lowest HHI, 4-Higest HHI)



INEFFICIENCY AND COMPETITION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF	INF	INF	INF	INF	INF	INF	INF
HHI	-0.043***	-0.024***						
	(-6.37)	(-4.02)						
NUM			0.229***	0.145***				
			(6.27)	(5.21)				
Census HHI					-0.071***	-0.099***		
					(-3.34)	(-7.37)		
HP HHI							-0.026***	-0.034***
							(-4.49)	(-5.10)
BM		-0.006***		-0.005***		-0.005***		-0.008***
		(-4.87)		(-4.86)		(-3.80)		(-8.02)
LEVERAGE		0.036***		0.037***		0.015		0.053***
		(5.97)		(6.29)		(1.41)		(6.08)
CASH		0.067***		0.060***		0.093**		0.057***
		(7.49)		(7.41)		(2.52)		(5.25)
SIZE		-0.007***		-0.007***		-0.007**		-0.012***
		(-6.97)		(-7.09)		(-2.30)		(-6.71)
TANGIBLE		0.037***		0.042***		-0.034*		0.030***
		(6.48)		(7.53)		(-1.80)		(3.44)
AGE		-0.004*		-0.003		-0.000		0.001
		(-1.94)		(-1.64)		(-0.04)		(0.36)
Constant	0.092***	0.106***	0.072***	0.092***	0.094***	0.120***	0.095***	0.133***
	(26.84)	(16.59)	(33.25)	(14.34)	(8.14)	(5.07)	(22.79)	(15.31)
Observations	60,170	60,128	60,202	60,160	5,289	5,288	31,134	31,112
Adjusted R2	0.002	0.018	0.005	0.019	0.000	0.007	0.001	0.017

INEFFICIENCY (NONLINEAR TERM)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF	INF	INF	INF	INF	INF	INF	INF
HHI	-0.140***	-0.083***						
	(-8.19)	(-5.54)						
HHI2	0.124***	0.074***						
	(6.82)	(4.57)						
NUM			0.576***	0.328***				
			(7.68)	(5.07)				
NUM2			-1.692***	-0.868***				
			(-5.93)	(-3.09)				
Census HHI					0.370*	0.196		
					(1.90)	(1.27)		
Census HHI2					-1.977**	-1.319*		
					(-2.44)	(-1.84)		
HP HHI							-0.067***	-0.068***
							(-3.14)	(-3.31)
HP HHI2							0.048**	0.039**
							(2.28)	(2.02)
BM		-0.006***		-0.005***		-0.005***		-0.008***
		(-4.85)		(-4.86)		(-3.92)		(-8.00)
LEVERAGE		0.036***		0.038***		0.016		0.053***
		(6.08)		(6.37)		(1.50)		(6.06)
CASH		0.064***		0.058***		0.091**		0.055***
		(7.28)		(7.05)		(2.54)		(5.24)
SIZE		-0.007***		-0.007***		-0.007**		-0.012***
		(-7.08)		(-7.04)		(-2.32)		(-6.69)
TANGIBLE		0.038***		0.041***		-0.034*		0.029***
		(6.68)		(7.45)		(-1.77)		(3.29)
AGE		-0.004*		-0.003*		-0.000		0.001
		(-1.87)		(-1.69)		(-0.00)		(0.46)
Constant	0.103***	0.113***	0.066***	0.088***	0.079***	0.110***	0.099***	0.138***
	(25.04)	(18.30)	(28.59)	(14.01)	(9.85)	(3.86)	(20.73)	(14.97)
Observations	60,170	60,128	60,202	60,160	5,289	5,288	31,134	31,112
Adjusted R2	0.003	0.018	0.006	0.019	0.000	0.007	0.001	0.017

FIRM SIZE AND INEFFICIENCY

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF	INF	INF	INF	INF	INF	INF	INF
HHI	-0.071***	-0.055***						
	(-3.68)	(-3.17)						
HHI*SIZE	0.007**	0.006**						
	(2.22)	(2.28)						
NUM			0.463***	0.397***				
			(3.80)	(3.56)				
NUM*SIZE			-0.056***	-0.054***				
			(-2.75)	(-2.71)				
Census HHI					0.023	-0.037		
					(0.18)	(-0.39)		
Census HHI*SIZE					-0.011	-0.013		
					(-0.41)	(-0.61)		
HP HHI							-0.098***	-0.087***
							(-5.11)	(-4.88)
HP HHI*SIZE							0.011***	0.012***
							(3.57)	(3.84)
BM		-0.006***		-0.005***		-0.005***		-0.008***
		(-4.89)		(-4.88)		(-3.88)		(-8.06)
LEVERAGE		0.036***		0.037***		0.015		0.053***
		(5.98)		(6.34)		(1.46)		(6.07)
CASH		0.067***		0.060***		0.093**		0.057***
		(7.49)		(7.40)		(2.51)		(5.23)
SIZE	-0.009***	-0.009***	-0.005***	-0.005***	-0.009***	-0.006**	-0.014***	-0.015***
	(-6.29)	(-5.79)	(-5.72)	(-5.43)	(-3.42)	(-2.13)	(-6.59)	(-6.76)
TANGIBLE		0.037***		0.040***		-0.034*		0.032***
		(6.52)		(7.16)		(-1.87)		(3.63)
AGE		-0.004**		-0.004*		-0.000		0.001
		(-2.01)		(-1.84)		(-0.03)		(0.45)
Constant	0.135***	0.113***	0.096***	0.082***	0.134***	0.116***	0.172***	0.144***
	(14.12)	(13.72)	(18.40)	(10.64)	(5.82)	(4.84)	(12.05)	(14.30)
Observations	60,170	60,128	60,202	60,160	5,289	5,288	31,134	31,112
Adjusted R2	0.008	0.018	0.011	0.019	0.002	0.007	0.010	0.017

ALTERNATIVE COMPETITION MEASURES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF	INF	INF	INF	INF	INF	INF	INF
EPCM	-0.009***	-0.006***						
	(-9.81)	(-6.27)						
TARIFF			-0.384***	-0.340***				
			(-3.69)	(-3.75)				
FREIGHT COST					-0.238**	-0.112**		
					(-2.24)	(-2.14)		
TRADE COST							-0.240***	-0.164***
							(-2.99)	(-3.05)
BM		-0.005***		-0.006***		-0.006***		-0.006***
		(-4.90)		(-2.87)		(-2.84)		(-2.88)
LEVERAGE		0.032***		0.036**		0.036**		0.037**
		(6.26)		(2.25)		(2.24)		(2.28)
CASH		0.051***		0.080***		0.084***		0.081***
		(10.24)		(7.73)		(7.86)		(7.77)
SIZE		-0.005***		-0.007***		-0.007***		-0.007***
		(-6.49)		(-4.52)		(-4.46)		(-4.48)
TANGIBLE		0.038***		0.032***		0.038***		0.039***
		(6.82)		(2.70)		(3.35)		(3.44)
AGE		-0.005***		-0.008***		-0.008***		-0.008***
		(-2.97)		(-2.86)		(-2.96)		(-2.92)
Constant	0.078***	0.095***	0.098***	0.122***	0.094***	0.110***	0.102***	0.118***
	(35.27)	(17.66)	(14.37)	(10.00)	(13.31)	(9.97)	(12.18)	(9.72)
Observations	59,684	59,656	14,911	14,905	14,911	14,905	14,911	14,905
Adjusted R2	0.007	0.024	0.004	0.032	0.003	0.030	0.005	0.032

ALTERNATE INEFFICIENCY MEASURES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF(SD)	INF(SD)	INF(SD)	INF(SD)	INF(Median)	INF(Median)	INF(Median)	INF(Median)
HHI	-0.040***				-0.012***			
	(-3.10)				(-4.63)			
NUM		0.240***				0.032***		
		(4.41)				(3.22)		
Census HHI			-0.187***				-0.096	
			(-2.76)				(-1.48)	
HP HHI				-0.043				-0.022***
				(-0.78)				(-3.52)
BM	-0.008***	-0.007***	-0.007***	-0.007**	-0.002***	-0.002***	-0.001	-0.005***
	(-6.90)	(-6.82)	(-3.92)	(-2.22)	(-4.00)	(-3.98)	(-0.36)	(-4.19)
LEVERAGE	0.083***	0.087***	0.042*	0.104**	0.004	0.004	-0.003	0.015
	(6.66)	(7.09)	(1.67)	(2.15)	(0.92)	(0.98)	(-0.20)	(1.44)
CASH	0.100***	0.089***	0.088**	0.121***	0.002	0.001	0.026	0.001
	(8.61)	(7.84)	(2.37)	(3.81)	(0.35)	(0.18)	(0.53)	(0.10)
SIZE	-0.011***	-0.011***	-0.008***	-0.036***	-0.000	-0.000	-0.002	-0.004***
	(-6.36)	(-6.34)	(-3.74)	(-5.52)	(-1.44)	(-1.40)	(-1.12)	(-3.11)
TANGIBLE	0.064***	0.071***	0.020	0.058***	-0.002	-0.002	-0.031*	0.000
	(5.07)	(5.59)	(1.07)	(3.84)	(-0.77)	(-0.50)	(-1.78)	(0.05)
AGE	-0.010***	-0.008***	-0.006	0.019***	0.001	0.001	0.006	0.003
	(-3.11)	(-2.61)	(-1.28)	(3.15)	(1.26)	(1.19)	(0.64)	(1.58)
Constant	0.143***	0.120***	0.146***	0.218***	0.014***	0.010**	0.021	0.034***
	(10.36)	(9.26)	(5.42)	(4.91)	(3.58)	(2.33)	(1.01)	(5.19)
Observations	7,483	7,487	737	1,044	60,128	60,160	5,288	31,112
Adjusted R2	0.034	0.037	0.051	0.029	0.000	0.000	0.000	0.002

CONDITIONAL ON FCF

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF	INF	INF	INF	INF	INF	INF	INF
HHI	-0.018	-0.026***						
	(-1.49)	(-5.67)						
NUM			0.093***	0.168***				
			(2.72)	(5.15)				
Census HHI					-0.104**	-0.193		
					(-2.19)	(-1.38)		
HP HHI							-0.035***	-0.034***
							(-3.61)	(-4.19)
BM	-0.010***	-0.002**	-0.010***	-0.002**	-0.014***	-0.002	-0.011***	-0.005***
	(-7.58)	(-2.07)	(-7.50)	(-2.00)	(-7.12)	(-0.71)	(-5.23)	(-4.98)
LEVERAGE	0.040***	0.029***	0.041***	0.030***	0.027*	0.042	0.053***	0.045***
	(5.34)	(2.92)	(5.54)	(3.09)	(1.76)	(1.20)	(5.49)	(3.17)
CASH	0.041***	0.084***	0.037***	0.074***	0.003	0.266	0.030***	0.085***
	(5.54)	(4.09)	(5.39)	(3.88)	(0.25)	(1.63)	(3.80)	(3.10)
SIZE	-0.007***	-0.006***	-0.007***	-0.006***	-0.005*	-0.013	-0.011***	-0.010***
	(-5.00)	(-4.24)	(-4.95)	(-4.31)	(-1.67)	(-1.28)	(-5.34)	(-4.28)
TANGIBLE	0.045***	0.020***	0.048***	0.027***	-0.062***	-0.005	0.040***	0.014*
	(4.17)	(3.58)	(4.59)	(4.58)	(-4.33)	(-0.19)	(2.98)	(1.69)
AGE	-0.003	0.004*	-0.003	0.005*	-0.009*	0.014	0.002	0.006
	(-1.11)	(1.72)	(-1.02)	(1.93)	(-1.96)	(0.63)	(0.56)	(1.64)
Constant	0.133***	0.060***	0.123***	0.045***	0.185***	0.060*	0.152***	0.087***
	(15.24)	(8.41)	(13.12)	(5.69)	(9.36)	(1.72)	(12.52)	(10.22)
Observations	24,377	24,388	24,394	24,401	2,124	2,145	15,558	15,553
Group	Low FCF	High FCF	Low FCF	High FCF	Low FCF	High FCF	Low FCF	High FCF
Adjusted R2	0.017	0.010	0.018	0.012	0.015	0.009	0.018	0.011

PRIVATE INFORMATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	INF	INF	INF	INF	INF	INF	INF	INF
HHI	-0.030***	-0.019**						
	(-4.13)	(-2.07)						
NUM			0.159***	0.147***				
			(3.90)	(3.71)				
Census HHI					-0.083**	-0.094		
					(-2.53)	(-1.33)		
HP HHI							-0.024***	-0.044***
							(-2.59)	(-4.30)
BM	-0.006***	-0.005***	-0.006***	-0.005***	-0.006***	-0.003	-0.007***	-0.009***
	(-6.11)	(-3.52)	(-6.16)	(-3.47)	(-3.66)	(-1.32)	(-4.73)	(-8.50)
LEVERAGE	0.037***	0.041***	0.038***	0.042***	0.019***	0.012	0.051***	0.060***
	(4.97)	(5.38)	(5.13)	(5.61)	(3.47)	(0.95)	(4.58)	(5.62)
CASH	0.051***	0.074***	0.044***	0.066***	0.023	0.147**	0.044***	0.061***
	(6.72)	(5.56)	(6.89)	(5.57)	(1.63)	(2.32)	(4.40)	(3.75)
SIZE	-0.006***	-0.008***	-0.006***	-0.008***	-0.002**	-0.013	-0.011***	-0.015***
	(-4.93)	(-5.83)	(-5.04)	(-6.00)	(-2.04)	(-1.39)	(-4.77)	(-5.10)
TANGIBLE	0.023***	0.037***	0.027***	0.043***	-0.025*	-0.048	0.020***	0.023
	(4.38)	(4.27)	(5.05)	(5.22)	(-1.96)	(-1.09)	(2.85)	(1.55)
AGE	-0.005***	-0.004	-0.005***	-0.003	-0.004	-0.000	-0.002	0.001
	(-2.91)	(-1.53)	(-2.63)	(-1.16)	(-1.01)	(-0.01)	(-0.84)	(0.41)
Constant	0.112***	0.105***	0.099***	0.091***	0.112***	0.131***	0.139***	0.142***
	(15.48)	(12.47)	(16.37)	(9.78)	(9.31)	(3.84)	(11.02)	(11.57)
Observations	28,884	28,931	28,906	28,939	2,487	2,631	15,042	15,117
Group	Low IDVOL	High IDVOL	Low IDVOL	High IDVOL	Low IDVOL	High IDVOL	Low IDVOL	High IDVOL
Adjusted R2	0.025	0.014	0.026	0.015	0.015	0.007	0.024	0.014

CONCLUSION

- Competition causes overinvestment
- Competition creates lower signal precisions
- As a result investment distortions (relative to perfect information) are higher in a more competitive environment
- Small firms are more inefficient than large firms
- Caveat: Our measure of efficiency does not take into account the costs of information acquisition. We therefore take as given the full information outcome is desirable
- Empirical results strongly verify the theory
- Nonlinear effects may be relevant
- Endogeneity of competition is established by the theory
- Robustness checks do not change the result