Does the stock market make firms more productive?

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[1]Compensation Goals and Firm Performance (with Carr Bettis, Radha Gopalan, and Todd Milbourn), 2017, Journal of Financial Economics, 124 (2), 307-330

wokering paper:

[1]Clawback Provisions and Firm Risk (with Ilona Babenka, John Bizjak, and Jeff Coles);
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[2]"Why Does Equity Capital Flow out of High Tobin's q Industries," with Dong Wook Lee and Hyun-Han Shin, 2021, Review of Financial Studies, 34,(4) 1867-1906.

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Abstract

- Management, directly or indirectly, learns from its firm's stock price, so a more informative stock price should make the firm more productive. We show that stock price informativeness increases firm productivity.
- We provide direct evidence of one channel through which stock price informativeness affects productivity; specifically, we find that **CEO turnover** is less sensitive to Tobin's q when informativeness is lower.
- We predict and confirm that the productivity of smaller and younger firms, better governed firms, more specialized firms, and firms with more competition is more strongly related to the informativeness of their stock price.
- We further address endogeneity concerns with the use of brokerage closures, S&P 500 additions, and mutual fund redemptions as plausibly exogenous events.

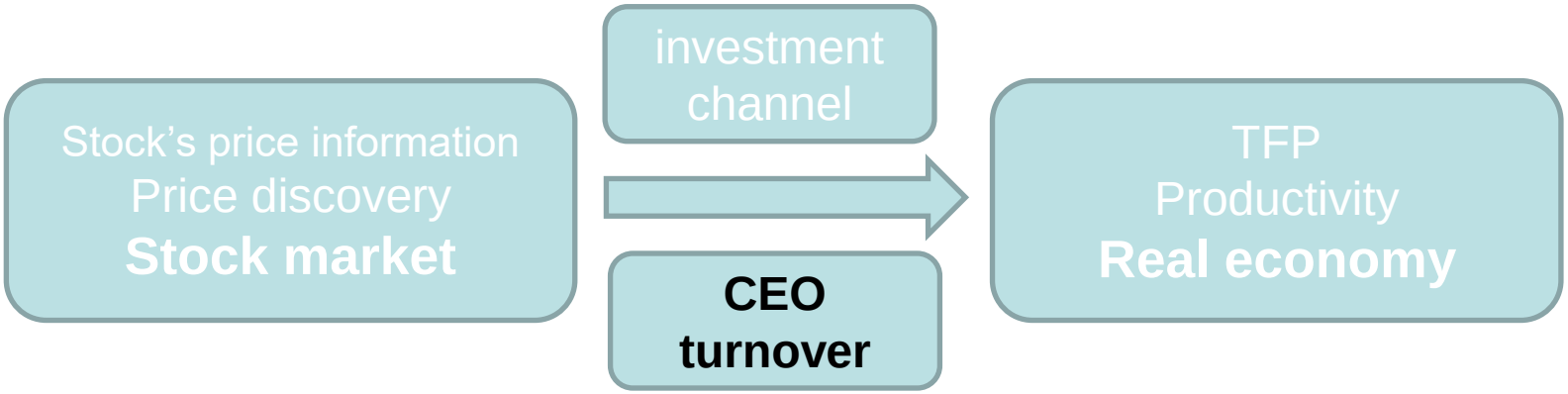
1. Introduction

1. Introduction

- We use differences in the quality of price discovery across US firms to investigate whether better price discovery makes firms more productive and whether it does so differentially across firms.
- After demonstrating that better stock market price discovery makes firms more productive, we show that the relation between the quality of stock price discovery and productivity varies across firms in predictable ways.

1. Introduction

Corporate managers can learn from the information in stock prices for mergers & acquisitions (M&A) decisions: if a firm's stock price drops after an M&A announcement, the manager may cancel the planned acquisition (Luo, 2005), the acquirer may itself be taken over (Mitchell and Lehn, 1990), or the CEO may lose her job (Lehn and Zhao, 2006). In addition to management, directors and activists can take actions to force changes in how firms are managed, and investors in general can take market-based corrective actions (Bond et al., 2010). Further, managerial incentives typically depend directly on stock prices. Bond et al. (2012) review the theoretical and empirical literature on the real effects of price discovery.



1. Introduction

- Contributions

- First, the paper adds to the literature on corporate productivity. We provide evidence that stock price informativeness has a positive effect on firms' TFP.
- Second, we show that the impact of SPI on TFP depends on firm characteristics. We find that the impact falls with firm size, age, and complexity; it increases with competition, financial constraints, and governance.
- Third, our paper adds to the literature on the effect of financial markets on the real economy.
- Fourth, our paper contributes to the literature that assesses the benefits and costs of exchange listings for corporations.

2. Literature review and hypothesis development

2. Literature review and hypothesis development

2.1. Review of existing literature

- ✓ There has been a noticeable increase in the attention paid by research in financial economics on the real ef_x0002_fects of financial markets on the economy. (Bond et al., 2012; Morck et al., 2013;Wurgler, 2000...)
- ✓ Price has an informational role.(Hayek, 1945; Fama and Miller, 1972; Dow and Gorton, 1997;Bond et al., 2010)
- ✓ There is also empirical evidence showing that price discovery in the stock market affects firms' decisions. (Durnev et al., 2004; Chen et al., 2007...)
- ✓ Existing studies also investigate how stock price discovery affects other corporate decisions besides investment. (Subrahmanyam and Titman,1999;Luo, 2005...)

2. Literature review and hypothesis development

2.1. Review of existing literature

- ✓ The only work we are aware of that bears on this issue is a calibration exercise in David et al. (2016) that is focused on investment and concludes that learning from financial markets contributes little to productivity.
- ✓ Different measures for the informativeness of stock prices in the literature:PSI, following Roll (1988) and Morck et al. (2000); PIN(Easley et al.,1996; and Easley et al., 2002a, 2002b)); Gammas (Llorente et al., 2002); APIN(Duarte and Young, 2009)
- ✓ TFP is the most widely used measure for productivity.We use a firm-level TFP calculated using a more recent method by Ackerberg et al. (2015).

2. Literature review and hypothesis development

2.2. Theoretical motivation for our tests

- ✓ In a Bayesian framework, the weight economic agents put on the stock price when a decision is taken depends on how informative the stock price is. Hence, if the stock price is not informative, they will ignore it, but if it is informative, it will affect their decision as long as the stock price is a useful signal for that decision.
- ✓ While investment decisions often affect the scale of operations, many other decisions do not affect the scale of operations but rather the efficiency of operations.It follows that decisions other than investment decisions may be more likely to have an impact on productivity.

3. Measures of stock price informativeness

3. Measures of stock price informativeness

3.1. Probability of information-based trading (PIN)

PIN measures the probability of information-based trading. Suppose that on a day new information appears with probability α, with probability δ the news is bad, and with probability $1-\delta$, the news is good. The probability of no news on a day is $1-\alpha$. The trading orders follow Poisson distributions. Uninformed traders trade irrespective of whether new information arrives or not. The arrival rate of uninformed buy (sell) orders is $\varepsilon_b(\varepsilon_s)$. The traders with private information only trade when there is new information, and the arrival rate is μ. The informed trader will only buy if the news is good and only sell if the news is bad. Given these parameters (α, δ, μ, ε_b, ε_s), the probability of information-based trading is

$$\mathrm{PIN} = \frac{\alpha \cdot \mu}{\alpha \cdot \mu + (\varepsilon_b + \varepsilon_s)}, \tag{1}$$

where the denominator is the arrival rate for all orders and the numerator is the arrival rate of informed orders.

3. Measures of stock price informativeness

3.1. Probability of information-based trading (PIN)

The parameters are estimated by maximum likelihood. On day i, we observe the number of buy orders B_i and the number of sell orders S_i. Denote the Poisson distribution function as $P(k;\lambda) = e^{-\lambda}\frac{\lambda^k}{k!}$, where k is the number of arrivals and λ is the arrival rate. The likelihood of information-based trading on a given trading day is

$$\begin{aligned} &L(\alpha, \delta, \mu, \varepsilon_b, \varepsilon_s | B_i, S_i) \\ &\quad = (1-\alpha)\cdot P(B_i;\varepsilon_b)\cdot P(S_i;\varepsilon_s) \\ &\qquad + \alpha\cdot\delta\cdot P(B_i;\varepsilon_b)\cdot P(S_i;\mu+\varepsilon_s) \\ &\qquad + \alpha\cdot(1-\delta)\cdot P(B_i;\mu+\varepsilon_b)\cdot P(S_i;\varepsilon_s). \end{aligned} \tag{2}$$

Assuming that trading activity across days is independently distributed, the likelihood function within a year is

$$V = \prod_{i=1}^{I} L(\alpha,\ \delta, \mu, \varepsilon_b, \varepsilon_s | B_i, S_i), \tag{3}$$

where I is the number of trading days in a year.

3. Measures of stock price informativeness

3.2. Stock price nonsynchronicity (PSI)

We decompose the stock return into the systematic part explained by the market return and industry return and firm-specific residual variation. When there is relatively more firm-specific variation, the return co-moves less with the market return and the industry return, so R_2 is smaller. To perform our decomposition, we use the following linear regression:

$$r_{j,i,t} = \beta_{j,0} + \beta_{j,m} r_{m,t} + \beta_{j,i} r_{i,t} + \varepsilon_{i,j,t}, \qquad (4)$$

where j is for firm j, i is for industry i, and t is for day t,$r_{j,\,i,\,t}$ is the stock return of firm j in industry i defined at the three-digit standard industrial classification (SIC) on day t, $r_{m,\,t}$ is the value weighted market return on day t, and $r_{i,\,t}$ is the value weighted industry return on day t.

3. Measures of stock price informativeness
3.2. Stock price nonsynchronicity (PSI)

- ✓ The regression is estimated for each firm j within a year, and the R_2 of the regression is used to construct PSI_j for stock j in a given year as follows:

$$PSI_j = \ln\left(\frac{1 - R_j^2}{R_j^2}\right). \quad (5)$$

4. Data and sample

4. Data and sample

Our firm-level accounting data are from Compustat. We use TAQ data to calculate PIN and the daily stock file from the Center for Research in Security Prices (CRSP) to calculate PSI. Mutual fund data are from the Thomson–Reuters mutual fund holdings database and CRSP mutual fund database. Institutional ownership and blockholder data are from Thomson–Reuters 13F. CEO turnover data are from ExecuComp. Corporate governance related data are from RiskMetrics. The product market competition variables we use are from the Hoberg–Phillips data library.

Our sample is from 1994 to 2015 and includes 66,341 firm-year observations.

5. Empirical evidence

Table 1

Summary statistics.

This table presents summary statistics for TFP, stock price informativeness measures PIN and PSI, and firm characteristics. The sample consists of firms in Compustat for which TFP and the stock price informativeness measures are available for the years 1994–2015, inclusive. All variables are winsorized at the 1st and 99th percentile values. Variable definitions are in Appendix A.

Variable	Mean	p25	p50	p75	SD	*N*
TFP	0.03	−0.33	0.00	0.37	0.60	66,341
PIN	0.22	0.14	0.20	0.28	0.11	66,341
PSI	2.22	0.90	2.06	3.44	1.71	63,504
Log (assets)	6.55	5.08	6.43	7.88	2.00	66,341
Cash/assets	0.14	0.02	0.08	0.21	0.17	66,341
Debt/assets	0.24	0.05	0.21	0.36	0.22	66,134
R&D/assets	0.03	0.00	0.00	0.03	0.06	66,341
Tobin's q	1.82	1.10	1.41	2.03	1.40	64,876
PP&E/assets	0.28	0.09	0.21	0.42	0.23	66,341
Business risk	0.03	0.02	0.03	0.04	0.02	55,492
Log (N_blockholders)	1.06	0.68	1.10	1.39	0.55	25,511
Diversified	0.42	0	0	1	0.49	66,341
SG&A/assets	0.25	0.07	0.19	0.35	0.25	66,341
G-index	8.94	7	9	11	2.74	19,796

5. Empirical evidence

5.1. Baseline regressions

If more informative stock prices help make firms more productive, we should find a positive relation between TFP and SPI. Our baseline regression specification regresses TFP on lagged average SPI and controls for firm characteristics, year fixed effects, and firm fixed effects:

$$TFP_{it} = \beta_0 + \beta_1 \cdot SPI_{i,t-3,t-1} + X_{it} \cdot \Gamma + \mu_i + \vartheta_t + \varepsilon_{it}, \quad (6)$$

where i is the firm index, t is the year index, $SPI_{i,t-3,t-1}$ stands for the measure of stock price informativeness, which is the average of the previous three years, X is the vector of control variables, Γ is the coefficient vector for the control variables, μ_i is the firm fixed effect, ϑ_t is the year fixed effect, and ε_{it} is the error term. The results are reported in Table 2.

Table 2

Price informativeness and productivity.

This table presents panel regressions of total factor productivity (TFP) on stock price informativeness and other firm-level controls. In Panel A, stock price informativeness is measured by the probability of informed trading (PIN) and stock price nonsynchronicity (PSI). IQS is investment-q sensitivity. In Panel B, we test additional SPI measures. The first measure is Gamma, a trading-based informativeness measure calculated in Eq. (12) in Llorente et al. (2002). We calculate this measure in two ways. The first method (Columns 1 and 4) is as in Eq. (3) in Frésard (2012) and controls for both firm and market returns, while the second method (Columns 2 and 5) only controls for firm returns as in the original Llorente et al. (2002). The last additional stock price informativeness measure, Adjusted PIN (APIN), is calculated using Eq. (7) in Duarte and Young (2009). In our regressions, we use the average SPI over the previous three years. All specifications include firm and year fixed effects. The sample consists of firms in Compustat for which TFP and the stock price informativeness measures are available for the years 1994–2015 except for Column 5 in Panel A, which is from 1962 to 2015. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Primary SPI measures (PIN & PSI)

Variables	(1) TFP	(2) TFP	(3) TFP	(4) TFP	(5) TFP	(6) TFP	(7) TFP
PIN	0.262***		0.256***			0.234***	
	[8.80]		[8.63]			[7.82]	
PSI		0.018***		0.019***	0.010***		0.020***
		[5.92]		[6.31]	[3.82]		[6.50]
Log (assets)	0.235***	0.238***	0.225***	0.228***	0.170***	0.221***	0.225***
	[35.75]	[34.41]	[33.39]	[32.15]	[30.02]	[31.49]	[30.50]
Tobin's q	0.079***	0.079***	0.077***	0.078***	0.136***	0.073***	0.074***
	[19.63]	[19.34]	[19.30]	[19.03]	[43.68]	[17.11]	[16.83]
Cash/assets			0.042	0.043	−0.049*	0.067**	0.070**
			[1.54]	[1.52]	[−1.85]	[2.30]	[2.33]
Debt/assets			−0.226***	−0.233***	−0.278***	−0.214***	−0.220***
			[−10.80]	[−10.88]	[−14.83]	[−9.91]	[−9.95]
R&D/assets			−1.139***	−1.137***	−1.943***	−1.153***	−1.145***
			[−9.78]	[−9.72]	[−15.84]	[−9.13]	[−9.04]
Capex/assets						0.658***	0.670***
						[9.90]	[10.05]
IQS						−0.008*	−0.009**
						[−1.90]	[−2.18]
Capex/assets* IQS						0.060	0.074*
						[1.43]	[1.74]
Observations	61,554	58,889	61,363	58,700	108,832	60,121	57,497
R-squared	0.178	0.176	0.192	0.191	0.172	0.172	0.172
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y

5.2.1. Brokerage research department closures

Table 3
The effect of brokerage house closures on stock price informativeness.
This table shows the effect of brokerage closures on stock price informativeness. The specification is as follows: $SPI_{it} = \beta_0 + \beta_1 \cdot Closure_{it} + X_{i,t-1} \cdot \Gamma + \mu_i + \vartheta_t + \varepsilon_{it}$. SPI is PIN or PSI. Closure is a dummy variable that equals one if a stock is covered by a closed research department in the previous one or two years and zero otherwise. Control variables are the same as used in Column 3 of Table 2. The sample consists of firms in Compustat for which the stock price informativeness measures are available for the years 1994–2015. Firm and year fixed effects are included. Robust standard errors are clustered at the firm level. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) PIN	(2) PSI
Closure	−0.013**	−0.101**
	[−2.48]	[−1.97]
Log (assets)	−0.032***	−0.469***
	[−22.06]	[−25.04]
Tobin's q	−0.005***	−0.278***
	[−5.74]	[−34.37]
Cash/assets	−0.008	−0.190**
	[−1.20]	[−2.51]
Debt/assets	0.035***	0.784***
	[6.48]	[10.90]
R&D/assets	−0.001	0.426*
	[−0.04]	[1.71]
Observations	44,359	42,257
R-squared	0.484	0.765
Firm FE	Y	Y
Year FE	Y	Y

5.2.1. Brokerage research department closures

Table 4

DiD analysis: brokerage house closures and productivity.

This table shows DiD tests based on the closures of brokerage house research departments. The sample is from 1996 to 2011. A firm is defined as a treated firm if its stock is covered by a closed research department. For each closure event, we define an event window as four years before to four years after the closure. For each treated firm, we use propensity score matching to choose a control firm in the same industry (two-digit SIC) and matched by total assets and Tobin's q using Mahalanobis distance. In Model 1 the treatment dummy Treatment_post equals one if a stock is covered by a closed research department and the year is between one and four years after the closure year and zero otherwise. In Model 2 we define four treatment dummy variables, one dummy for each year during the four years after a closure. Closure years are dropped in the regressions. All specifications include firm fixed effects and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) TFP	(2) TFP
Treatment_post	−0.043**	
	[−2.29]	
One year after closure		−0.051***
		[−2.75]
Two years after closure		−0.049**
		[−2.45]
Three years after closure		−0.040*
		[−1.80]
Four years after closure		−0.043*
		[−1.94]
Log (assets)	0.248***	0.249***
	[12.88]	[12.98]
Tobin's q	0.035***	0.035***
	[3.85]	[3.85]
Cash/assets	0.173**	0.173**
	[2.27]	[2.27]
Debt/assets	−0.248***	−0.246***
	[−4.76]	[−4.71]
R&D/assets	−1.364***	−1.361***
	[−3.23]	[−3.22]
Observations	7,851	7,851
R-squared	0.801	0.801
Firm FE	Y	Y
Year FE	Y	Y

5.2.2. S&P 500 index additions

Table 5

The effect of S&P 500 additions on stock price informativeness.

This table shows the effect of S&P 500 additions on the stock price informativeness. The specification is as follows: $SPI_{it} = \beta_0 + \beta_1 \cdot \text{Addition}_{it} + X_{i,t-1} \cdot \Gamma + \mu_i + \vartheta_t + \varepsilon_{it}$. SPI is PIN or PSI. Addition is a dummy variable that equals one if a firm is added to the S&P 500 index in the previous one or two years and zero otherwise. Control variables are the same as used in Column 3 of Table 2. Firm and year fixed effects are included. The sample includes firms with above yearly median book assets because firms added into S&P 500 index are unlikely to have assets below median assets. Robust standard errors are clustered at the firm level. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) PIN	(2) PSI
Addition	−0.008*	−0.154***
	[−1.66]	[−3.31]
Log (assets)	−0.019***	−0.297***
	[−9.80]	[−10.45]
Tobin's q	−0.002**	−0.106***
	[−2.17]	[−5.21]
Cash/assets	−0.011	−0.275**
	[−1.28]	[−2.53]
Debt/assets	0.041***	0.848***
	[4.91]	[6.93]
R&D/assets	0.001	0.220
	[0.02]	[0.47]
Observations	21,830	20,913
R-squared	0.356	0.726
Firm FE	Y	Y
Year FE	Y	Y

Table 6

DiD analysis: S&P 500 index additions and productivity.

This table shows DiD tests based on S&P 500 index additions. A firm is defined as a treated firm if it is added to the S&P 500 index in a year. For each index addition, we define an event window as four years before to four years after the index addition. For each treated firm, we use propensity score matching to choose a control firm in the same industry (two-digit SIC) and matched by total assets and Tobin's q with minimum Mahalanobis distance in Models 1, 4, 5, and 6. We use additional match variable lagged stock return in Model 2 or lagged TFP in Model 3. In Models 1 to 5 the treatment dummy, SP500_addition, equals one if a firm is added to the S&P 500 index over the previous four years and zero otherwise. In Model 6 we define four treatment dummy variables, one dummy for each year during the four years after a closure. All specifications include firm and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) TFP	(2) TFP	(3) TFP	(4) TFP	(5) TFP	(6) TFP
SP500_addition	−0.083***	−0.100***	−0.082***	−0.084***	−0.058**	
	[−3.81]	[−4.78]	[−4.00]	[−3.77]	[−2.16]	
One year after add						−0.036*
						[−1.86]
Two years after add						−0.105***
						[−3.87]
Three years after add						−0.141***
						[−4.42]
Four years after add						−0.146***
						[−4.44]
Log (assets)	0.167***	0.208***	0.195***	0.192***	0.197***	0.183***
	[7.26]	[8.31]	[9.64]	[7.22]	[5.94]	[7.43]
Tobin's q	0.049***	0.052***	0.057***	0.043***	0.060***	0.066***
	[6.38]	[5.11]	[6.82]	[6.01]	[4.66]	[6.18]
Cash/assets	−0.025	0.080	0.138	−0.035	−0.085	−0.077
	[−0.24]	[0.71]	[1.34]	[−0.27]	[−0.62]	[−0.68]
Debt/assets	−0.288***	−0.253***	−0.302***	−0.248***	−0.232**	−0.243***
	[−3.57]	[−2.97]	[−4.85]	[−3.15]	[−2.56]	[−2.83]
R&D/assets	−1.207**	−1.086**	−0.980*	−0.690	−0.433	−1.047**
	[−2.28]	[−2.26]	[−1.92]	[−1.30]	[−1.00]	[−2.01]
Amihud				−0.098***	−1.453***	
				[−2.65]	[−6.64]	
Stock return				0.017	−0.009	
				[1.03]	[−0.59]	
Inst ownership					0.071	
					[0.73]	
Observations	3,908	3,855	3,887	3,202	2,141	3,482
R-squared	0.193	0.210	0.230	0.176	0.178	0.191
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

5.2.3. Mutual fund redemption shock

Table 7

Mutual fund flow pressure and stock price informativeness.

This table presents the estimates of the specification $SPI_{it} = \beta_0 + \beta_1 \cdot MFFlow_{i,t-1} + X_{i,t-1} \cdot \Gamma + \mu_i + \vartheta_t + \varepsilon_{it}$. SPI is PIN or PSI. MFFlow is a dummy variable that equals one if a stock's hypothetical fund sales is positive and zero otherwise. The hypothetical fund sales are constructed as in Edmans et al. (2012). The sample consists of firms in Compustat for which the stock price informativeness measures are available for the years 1994–2015. Firm fixed effects and year fixed effects are included. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) PIN	(2) PSI
MFFlow	−0.005***	−0.137***
	[−3.75]	[−8.67]
Log (assets)	−0.032***	−0.439***
	[−21.92]	[−22.82]
Tobin's q	−0.005***	−0.136***
	[−5.72]	[−7.13]
Cash/assets	−0.007	−0.341***
	[−1.16]	[−4.25]
Debt/assets	0.034***	0.840***
	[6.37]	[10.93]
R&D/assets	−0.001	0.400
	[−0.05]	[1.53]
Observations	44,359	42,257
R-squared	0.484	0.760
Firm FE	Y	Y
Year FE	Y	Y

5.2.3. Mutual fund redemption shock

Table 8

Mutual fund redemption pressure and TFP.

This table shows the effect of mutual fund redemption on TFP. The specification is $TFP_{it} = \beta_0 + \beta_1 \cdot MFFlow_{i,t-1} + X_{it} \cdot \Gamma + \mu_i + \vartheta_t + \varepsilon_{it}$. MFFlow is a dummy variable that equals one if a stock's hypothetical fund sales is positive and zero otherwise. The hypothetical fund sales follow that in Edmans et al. (2012). The sample consists of firms in Compustat for which our TFP variable is available for the years 1994–2015. Firm fixed effects and year fixed effects are controlled. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) TFP	(2) TFP
MFFlow	−0.012***	−0.013***
	[−2.93]	[−3.15]
Log (assets)	0.217***	0.209***
	[36.11]	[33.92]
Tobin's q	0.128***	0.126***
	[42.33]	[42.00]
Debt/assets		−0.207***
		[−10.95]
Cash/assets		0.018
		[0.69]
R&D/assets		−1.196***
		[−10.85]
Observations	67,572	67,364
R-squared	0.791	0.794
Firm FE	Y	Y
Year FE	Y	Y

6. How does price informativeness affect TFP?

6.1. Price informativeness, CEO turnover, and productivity

Panel A: CEO turnover sensitivity to q and mutual fund flow pressure		
Variables	(1) CEO turnover	(2) CEO turnover
MFFlow × tobin's q	0.130***	0.126***
	[2.80]	[2.84]
Tobin's q	−0.211***	−0.078**
	[−5.40]	[−2.01]
MFFlow	−0.353***	−0.347***
	[−3.68]	[−3.74]
Log (assets)	0.086***	0.082***
	[5.02]	[4.69]
Return volatility	8.545***	3.253
	[4.21]	[1.43]
ROA		−3.787***
		[−13.77]
Debt/Assets		−0.368**
		[−2.46]
Old CEO		0.862***
		[19.20]
Observations	21,148	20,691
R-squared	0.0110	0.0461
Industry FE	Y	Y
Year FE	Y	Y
Panel B: CEO turnover sensitivity to q and brokerage research department closures		

6.1. Price informativeness, CEO turnover, and productivity

Panel B: CEO turnover sensitivity to q and brokerage research department closures

Variables	(1) CEO turnover	(2) CEO turnover
Tobin's q × closure_post	0.255*	0.270**
	[1.86]	[1.98]
Tobin's q	−0.236***	−0.168**
	[−3.57]	[−2.25]
Closure_post	−0.423	−0.432
	[−1.34]	[−1.36]
Log (assets)	0.044	0.062
	[1.00]	[1.39]
Volatility	5.009	−0.005
	[1.01]	[−0.00]
ROA		−2.068***
		[−3.03]
Debt/assets		−0.270
		[−0.73]
Old CEO		0.006
		[0.05]
Observations	3,410	3,371
R-squared	0.0132	0.0177
Industry FE	Y	Y
Year FE	Y	Y

6.1. Price informativeness, CEO turnover, and productivity

Table 10

CEO turnover and improvements of TFP.

This table presents the estimates for the specification $\Delta TFP_{it} = \beta_0 + \beta_1 \cdot Turnover_{t-1} + \beta_2 \cdot Turnover_{i,t-2} + X_{i,t} \cdot \Gamma + \mu_j + \vartheta_t + \varepsilon_{it}$. Δ is the first-difference operator. Turnover is a dummy variable that equals one if a firm experiences a CEO turnover in the year and zero otherwise. In Model 2 we further include a Turnover dummy for the year $t-3$. The sample consists of firms in the sample of Table 4, for which Execucomp data are available. Firm fixed effects and year fixed effects are controlled. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) ΔTFP	(2) ΔTFP
$Turnover_{t-1}$	0.006	0.006
	[1.08]	[1.01]
$Turnover_{t-2}$	0.013**	0.012**
	[2.39]	[1.98]
$Turnover_{t-3}$		0.004
		[0.62]
Log (assets)	−0.013**	−0.008
	[−2.57]	[−1.61]
Tobin's q	0.039***	0.047***
	[13.87]	[15.86]
Cash/assets	0.084***	0.081**
	[2.85]	[2.50]
Debt/assets	−0.023	−0.022
	[−1.40]	[−1.27]
R&D/assets	−0.721***	−0.660***
	[−4.46]	[−3.93]
Observations	22,537	19,858
R-squared	0.081	0.082
Firm FE	Y	Y
Year FE	Y	Y

6.2. Price informativeness, inputs, and outputs

Table 11

Outputs, inputs, and TFP improvements.

This table presents panel regressions of revenue, operating, and labor expenses on stock price informativeness and other firm-level controls. The operating cost is measured by SG&A (scaled by total assets), and the labor cost is measures by the wage expenses (xlr in Compustat). Stock price informativeness is measured by the probability of information-based trading (PIN) and stock price nonsynchronicity (PSI). In our regressions, we use the average PIN or PSI over the previous three years. The sample consists of firms in Compustat for which the stock price informativeness measures are available for the years 1994–2015. All specifications include firm and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Variables	(1) Log (Revenue)	(2) Log (Revenue)	(3) SG&A	(4) SG&A	(5) Log (LaborCost)	(6) Log (LaborCost)
PIN	0.042***		−0.026***		−0.295***	
	[2.93]		[−3.89]		[−3.77]	
PSI		0.009***		−0.002**		−0.018*
		[6.24]		[−2.34]		[−1.91]
Log (assets)	0.410***	0.418***	−0.004*	−0.004**	0.633***	0.635***
	[56.46]	[56.23]	[−1.67]	[−1.96]	[27.85]	[25.71]
Tobin's q	0.035***	0.036***	−0.009***	−0.009***	−0.006	−0.007
	[19.00]	[18.79]	[−11.50]	[−11.42]	[−0.72]	[−0.88]
Cash/assets	−0.321***	−0.329***	0.027***	0.031***	−0.18	−0.241*
	[−18.10]	[−18.35]	[3.46]	[3.91]	[−1.43]	[−1.92]
Debt/assets	−0.086***	−0.088***	0.012***	0.012***	−0.186***	−0.219***
	[−7.92]	[−7.89]	[2.86]	[2.81]	[−2.73]	[−3.25]
R&D/assets	0.593***	0.605***	0.465***	0.467***	3.683***	3.681***
	[10.81]	[10.94]	[13.45]	[13.37]	[5.03]	[4.94]
PP&E/assets	−0.094***	−0.104***	0.011	0.015	0.452***	0.426***
	[−3.77]	[−4.02]	[1.20]	[1.49]	[3.52]	[3.23]
Log (revenue($t-1$))	0.498***	0.494***	−0.017***	−0.017***		
	[55.61]	[54.02]	[−7.35]	[−7.00]		
Observations	63,739	60,953	63,739	60,953	7,603	7,347
R-squared	0.889	0.889	0.077	0.079	0.663	0.661
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

7. Cross-sectional heterogeneity

7.1. Firm characteristics

Table 12

Firm characteristics, price informativeness, and productivity.

This table presents estimates of panel regressions of TFP on the interactions of firm characteristics and stock price informativeness and other firm level control variables. The dependent variable in all specifications is TFP. Stock price informativeness is measured by the probability of information-based trading (PIN) and stock price nonsynchronicity (PSI). In our regressions, we use the average PIN or PSI over the previous three years. The sample consists of firms in Compustat for which the stock price informativeness measures are available for the years 1994–2015. All controls used in Columns 3 and 4 of Table 3 are included, but for brevity their coefficients are not displayed. All specifications include firm and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm characteristic	High assets		Firm age		Diversified		Business risk	
Firm characteristic × PIN	−0.167***		−0.013***		−0.144***		5.950***	
	[−3.25]		[−6.25]		[−2.85]		[4.22]	
Firm characteristic × PSI		−0.008*		−0.001***		−0.007*		0.580***
		[−1.88]		[−5.38]		[−1.88]		[5.51]
PIN	0.335***		0.453***		0.298***		0.089*	
	[8.42]		[9.98]		[7.66]		[1.68]	
PSI		0.022***		0.034***		0.023***		0.001
		[6.47]		[8.34]		[6.57]		[0.16]
Firm characteristic	0.058***	0.035**	−0.002**	−0.003***	−0.002	−0.017	−3.568***	−3.663***
	[3.74]	[2.44]	[−2.15]	[−2.77]	[−0.16]	[−1.39]	[−8.57]	[−9.86]
Observations	61,363	58,700	61,045	58,402	47,428	45,620	51,377	49,212
R-squared	0.193	0.191	0.195	0.194	0.204	0.202	0.200	0.199
Other controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y

7.2. Financial constraints

Table 13

Financial constraints, price informativeness, and productivity.

This table presents estimates of panel regressions of TFP on the interactions of financial constraint measures and stock price informativeness and other firm-level control variables. We use four financial constraint measures: no-dividend dummy, Whited and Wu index, no bond rating dummy, and Kaplan–Zingales index. The dependent variable in all specifications is TFP. Stock price informativeness is measured by the probability of information-based trading (PIN) and stock price nonsynchronicity (PSI). In our regressions, we use the average PIN or PSI over the previous three years. The sample consists of firms in Compustat for which the stock price informativeness measures are available for the years 1994–2015. All controls used in Columns 3 and 4 of Table 2 (Panel A) are included, but for brevity their coefficients are not displayed. All specifications include firm and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fin. constraint	No dividend		WW index		Bond rating		KZ index	
PIN × Fin. const.	0.119***		0.705***		0.108**		0.005	
	[2.66]		[3.05]		[2.18]		[0.31]	
PSI × Fin. const.		0.010***		0.043**		0.008*		0.002*
		[3.02]		[2.07]		[1.73]		[1.89]
PIN	0.151***		0.381***		0.145***		0.214***	
	[4.26]		[4.90]		[3.86]		[7.54]	
PSI		0.009**		0.023***		0.010**		0.017***
		[2.56]		[3.63]		[2.44]		[5.62]
Fin. const.	−0.010	−0.006	1.122***	1.244***	0.017	0.025	−0.022***	−0.026***
	[−0.77]	[−0.54]	[12.69]	[14.01]	[1.05]	[1.60]	[−5.06]	[−6.64]
Observations	57,394	54,834	56,774	54,229	50,783	48,497	52,524	50,119
R-squared	0.205	0.204	0.219	0.213	0.198	0.197	0.215	0.215
Other controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y

7.3. Product market competition

Table 14

Product market competition, stock price informativeness, and productivity.

This table presents estimates of panel regressions of TFP on the interactions of product market competition measures and stock price informativeness and other firm level control variables. Product market competition is measured by product similarity, product market fluidity, and TNIC HHI. The text-based network industry classification is used to construct these measures, which are available at the Hoberg–Phillips Data Library. In the tests, dummy variables for high competition are defined based on these competition measures: high similarity, high fluidity, and low HHI, which are based on the median of the relevant measures in a year. The dependent variable in all specifications is TFP. Stock price informativeness is measured by the probability of information-based trading (PIN) and stock price nonsynchronicity (PSI). In our regressions, we use the average PIN or PSI over the previous three years. The sample consists of firms in Compustat for which the stock price informativeness measures are available for the years 1994–2015. All controls used in Columns 3 and 4 of Table 2 (Panel A) are included, but for brevity their coefficients are not displayed. All specifications include firm and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Competition Measure	Low HHI		High similarity		High fluidity	
Competition × PIN	0.111***		0.091*		0.044	
	[2.81]		[1.75]		[0.87]	
Competition × PSI		0.010***		0.008**		0.006*
		[3.31]		[1.97]		[1.69]
PIN	0.301***		0.319***		0.336***	
	[8.98]		[9.20]		[9.83]	
PSI		0.023***		0.025***		0.026***
		[7.22]		[7.77]		[8.27]
Competition	−0.022**	−0.017**	−0.027**	−0.022**	−0.036***	−0.036***
	[−2.26]	[−2.41]	[−2.14]	[−2.19]	[−3.17]	[−4.15]
Observations	46,848	44,780	46,848	44,780	43,421	41,490
R-squared	0.363	0.360	0.362	0.360	0.371	0.368
Other controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

7.4. Corporate governance

Table 15

Corporate governance and the role of stock price informativeness.

This table presents estimates of panel regressions of TFP on the interactions of corporate governance measures and stock price informativeness and other firm-level control variables. The strength of corporate governance is measured by a high institutional ownership dummy (based on median in a year), the number of blockholders (logarithm), and the G-index (Gompers et al., 2003). The dependent variable in all specifications is TFP. Stock price informativeness is measured by the probability of information-based trading (PIN) and stock price nonsynchronicity (PSI). In our regressions, we use the average PIN or PSI over the previous three years. The sample consists of firms in Compustat for which the stock price informativeness measures and the governance measures are available for the years 1994–2015. All controls used in Columns 3 and 4 of Table 2 (Panel A) are included, but for brevity their coefficients are not displayed. All specifications include firm and year fixed effects. Robust standard errors are clustered at the firm level. Variable definitions are in Appendix A. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Governance measure	High inst. ownership		Log (N_blockholders)		G-index	
Governance × PIN	0.147**		0.138**		−0.051***	
	[2.15]		[2.18]		[−3.62]	
Governance × PSI		0.020***		0.016***		−0.000
		[3.89]		[3.62]		[−0.30]
PIN	0.160***		0.080		0.597***	
	[2.73]		[1.00]		[4.22]	
PSI		0.016**		0.006		0.012
		[2.56]		[0.87]		[0.78]
Governance	−0.005	−0.003	−0.062***	−0.058***	0.001	−0.009
	[−0.37]	[−0.31]	[−4.96]	[−6.66]	[0.17]	[−1.49]
Observations	22,286	21,229	22,286	21,229	15,328	14,817
R-squared	0.224	0.223	0.226	0.224	0.214	0.211
Other controls	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

8. Alternative efficiency measures

We now show that the relation between TFP and SPI holds for other efficiency measures. Following Loderer et al. (2016), we use the following five efficiency measures: sales/book-value-of-assets ratio, sales/value-of-assets-in-place (VAIP) ratio, cost of goods sold (COGS) per employee, ROA, and the loss dummy for negative net in_x0002_come. We also include a TFP growth measure originally proposed by Chun et al. (2011).

9.Conclusion

Our paper provides evidence that an increase in the informativeness of a firm's stock price causes an increase in the firm's productivity.

We show that firms' CEO turnover decisions are less sensitive to Tobin's q after firms experience fund flow pressure or a brokerage firm closure and a reduction in CEO turnover has an adverse impact on firm productivity.

We predict and confirm that firm size, firm age, and firm complexity affect adversely the ability of the firm to exploit information in its stock price. We also find that financial constraints, product market competition, and better governance amplify the sensitivity of productivity to stock price informativeness.

Our results have implications for the role of the stock market and the benefits of being a listed company.

Our analyses focus on US public firms, but our findings may have implications on cross-country differences in living standards.

THANKS !