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IT Investments under Earnings Pressure

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Short Paper

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Abstract

Recent research has shown managers' tendency to cut discretionary investments to meet short-term earnings targets. However, how these aspirational levels of performance and associated conflicts of interest between managers and shareholders influence information technology (IT) investments has hardly been examined. Drawing on behavioral agency theory, we analyze how earnings pressure – the pressure managers feel to meet or beat analysts' consensus earnings forecast – influences IT investments. We find that earnings pressure is associated with a reduction in firms' IT investment commitment, based on the frequency of sentences within 10-K filings emphasizing IT investment. This finding points towards a hitherto unconsidered influence of capital markets on IT investments in literature on IT investment determinants. Further, we plan to analyze if this reduction entails negative or positive stock market performance consequences. Understanding the performance consequences will allow us to lay the foundation towards effectively addressing this issue within corporate governance.

Keywords: IT investment, earnings pressure, corporate governance, behavioral agency theory, performance shortfall, real earnings management

Introduction

Information technology (IT) spending accounted for 6.9% of revenue in 2020, thereby almost doubling since 2011 (Kappelman et al. 2021). This increase reflects the notion that managers regard IT investments as one of the – if not the – most critical investment concerning future profitability and competitiveness of a firm (Mithas et al. 2012). However, despite their benefits, managers might be forced to reduce IT investments to meet short-term earnings targets. Most recent research on the determinants of IT investments highlights this by showing an association between firms engaging in real earnings management (REM) – which describes the short-term alteration of real business activities to meet earnings targets (Xue et al. 2021) – and falling short of strategically planned IT investments. While REM is more commonly perceived as an expression of managerial self-interest – i.e., value-destroying – it cannot generally be considered harmful – i.e., it can also be value-enhancing (see Xue et al. 2021). These insights inevitably prompt the need for further investigation regarding the genesis and performance consequences of REM of IT investments, to determine if there is a need for intervention and thus an adjustment of current corporate governance systems – i.e., the mechanisms applied to control and motivate managers in order to assure shareholders' return on their investment (Shleifer and Vishny 1997).

Regarding the genesis of REM of IT investments, only few studies consider the adverse effects of managerial self-interest as a determinant of IT investments (Dong et al. 2021; Xue et al. 2021), although prior research shows that earnings pressure – the pressure managers perceive when analysts' expectations about the firm's future earnings exceed their own expectations about future earnings – leads firms to alter strategic business decisions by pursuing REM (Currim et al. 2018; Zhang and Gong 2018). While the findings of Xue et al. (2021) suggest a negative association between REM and commitment to IT infrastructure investment, we still know little about its genesis and especially the role forward-looking external short-term earnings benchmarks (i.e., analysts' consensus earnings forecast) might play in it. Drawing on behavioral agency theory (Dong et al. 2021), we want to examine whether and to what extent earnings pressure leads firms to

alter their IT investments. Therefore, we ask the following research question (RQ1): Does earnings pressure negatively affect firms' IT investment commitment?

Further, a closer investigation of the performance consequences of REM of IT investments sheds light on whether adjustments of current corporate governance systems are necessary. REM cannot be considered detrimental per se but may also be an expression of external monitoring by the capital markets (Zhang and Gimeno 2010). Insights into the performance consequences allow us to identify whether these alterations primarily serve managerial self-interest and must be considered agency costs, or if they stem overinvestment in the interest of a firm's shareholders (Dong et al. 2021). Therefore, we ask the following research question (RQ2): Do firms with greater IT investment commitment throughout past periods under earnings pressure show lower or higher stock market performance?

To answer our research questions, we conduct panel data analysis on a sample of 997 publicly traded U.S. firms comprising 6,851 firm-year observations between 2005 and 2019. Our preliminary results, measuring IT investment commitment based on the frequency of sentences within 10-K filings emphasizing IT investment, point towards a negative relationship between earnings pressure and IT investments. First, with this finding, we contribute to literature on the determinants of IT investment by further examining the genesis of REM of IT investments. Specifically, we identify earnings pressure exerted by capital markets as a potential determinant of IT investments. Second, we contribute to IT-related corporate governance literature by extending the scope of behavioral agency theory in the context of IT investment decisions. Compared to previous research that analyzes the effect of past accounting performance on IT investments, we incorporate a forward-looking aspirational performance target and show that future performance relative to this benchmark might be a relevant determinant of IT investments. Third, we plan to contribute to IT-related corporate governance literature by dissolving the interpretation ambiguity of REM of IT investments and identifying whether there is a specific demand for adjustments to corporate governance systems.

Theory and Hypotheses

Background

First, we bridge two streams of literature to argue for a link between earnings pressure and the REM of IT investments. On the one hand, there is a growing stream of literature at the intersect of management, marketing, and accounting literature that examines the link between the earnings pressure and the alteration of real business activities, i.e., REM. Earnings pressure, or more generally the (allegedly bad) pressure analysts' short-term earnings forecasts exert on firms, is a frequently debated issue in research and news media over the past decades (Zhang and Gimeno 2010). Still, research examining the impact of earnings pressure on real business activity remains sparse (Zhang and Gimeno 2010). This is partly a consequence of the difficulty to develop a measure capturing the earnings pressure exerted on management at the beginning of the respective period, before any means of earnings management take place. This is necessary to identify its subsequent influence on the outcomes of various real business activities (Zhang and Gimeno 2010). In their seminal work, Zhang and Gimeno (2010) develop a sufficient operationalization and illustrate that firms undertake REM in the form of less aggressive competitive behavior – exploiting pricing power in an oligopolistic market to increase current earnings – under earnings pressure. Similarly, firms pursue REM in the form of a reduction of discretionary investments in R&D and capital expenditures (Zhang and Gong 2018) and marketing spending (Currim et al. 2018) under earnings pressure.

On the other hand, literature on the business value of IT illustrates why IT investments might be particularly threatened to be cut under earnings pressure, i.e., becoming subject to REM. When under earnings pressure CEOs may prioritize other discretionary or risky investments, believing (rightly or wrongly) that these contribute more directly to revenue-generating core business (Xue et al. 2021). For one reason, CIOs might have less power to secure resources compared to other C-level executives which is exaggerated by IT often being seen as negligible from a strategic standpoint by CEOs, in that it does not offer a competitive advantage due to the widespread dissemination and ubiquity of IT (Xue et al. 2021). Additionally, traditional performance metrics like NPV tend to underestimate the value of IT which is characterized by particular dynamism and long-termism (Kumar 2004), while simultaneously IT investments appear to be more risky than other capital investments (Dewan et al. 2007). Lastly, prior research suggests that firms preferably apply earnings management techniques that are hard to detect for auditors, regulators, and

shareholders (Cohen et al. 2008) which likely makes IT investments more susceptible, e.g., compared to R&D, since delaying, postponing, or even foregoing IT projects mid-stream is frequent in general (Xue et al. 2021) and R&D expenditures must be disclosed if they are material (Benner and Ranganathan 2012). In summary, we believe it is imperative to study the influence of earnings pressure on IT investments.

Second, we draw on literature on IT investment determinants and IT-related corporate governance which specifically addresses agency theoretical considerations. Within literature on determinants of IT investments prior research mostly takes a value-creation perspective or an institutional perspective (see Xue et al. 2021). To the best of our knowledge, only two recently published studies by Xue et al. (2021) and Dong et al. (2021) expand literature on IT investment determinants to the subject of corporate governance by incorporating agency theoretic considerations, i.e., examining if, and under which conditions the separation of ownership and control determines IT investments. Specifically, Xue et al. (2021) examine the association between REM and commitment to IT investment plans, finding a negative association that is mitigated by more decentralized decision rights. The findings of Dong et al. (2021) suggest that corporate governance plays a monitoring and controlling role in managers' IT investment decisions when falling short of aspirational performance targets and mitigates an overinvestment tendency. Compared to Dong et al. (2021) who focus on ROA relative to industry peers' ROA, a backward-looking performance target, we apply performance relative to analysts' consensus earnings forecast, a forward-looking performance target. In other words, while Dong et al. (2021) examine the influence of past performance shortfalls on IT investments, we focus on the influence of future performance shortfalls. When facing investment decisions at the beginning and throughout the period, managers likely have a forward-looking perspective and focus on the aspirational performance targets set by analysts (Schulz and Wiersema 2018). Therefore, earnings pressure may be better suited to depict the trade-off between short-term earnings and long-term performance managers face when making IT investment decisions.

Theoretical Framework

Behavioral agency theory (Wiseman and Gomez-Mejia 1998), which integrates the behavioral theory of the firm (BTOF) and agency theory to explain firm behavior (Cyert and March 1963; Jensen and Meckling 1976), builds the theoretical framework of our study. BTOF explains organizational decisions as a response to performance feedback, i.e., if performance falls short of the aspirational level, actions to close the performance gap are pursued (Cyert and March 1963). Prior research argues that managers perceive analysts' consensus earnings forecast as one of the most important aspirational performance targets (Schulz and Wiersema 2018). This conjecture is supported by the results of a survey where executives not only declared that they perceive earnings as the most important externally reported performance metric but also admit their widespread willingness to sacrifice long-term value to meet earnings targets (Graham et al. 2005). Managers perceive earnings pressure when analysts' consensus earnings forecast exceeds their own expectation about the firm's future earnings (Zhang and Gimeno 2010). Among the managerial reactions to earnings pressure that also comprise accounting manipulations and earnings guidance (Zhang and Gimeno 2010), REM stands out as it states an intervention in the actual "amount or the temporal flow of true economic profits" (Mizik 2010). Research shows that earnings pressure leads firms to engage in REM, as they cut discretionary R&D, advertising, and capital expenditures (Currim et al. 2018; Zhang and Gong 2018). Consequently, BTOF offers an explanation for the observed engagement in REM in response to earnings pressure, which states an effort to close the performance gap, but it assumes consistency of interests between shareholders and managers (Cyert and March 1963; Dong et al. 2021).

In behavioral agency theory, BTOF is complemented by agency theory. This allows to take into consideration the conflicting interests of shareholders and managers, which are prevalent due to the separation of ownership and control, and lead to agency costs when managers pursue self-maximizing decisions, not in the interest of shareholders (Jensen and Meckling 1976). Under agency theoretical considerations there are two different interpretations for REM. On the one hand, which can be stated as the predominant perspective on this issue, REM has been suspected to be detrimental to shareholder value and can therefore be interpreted as an adverse outcome of the agency conflict (e.g., Rappaport 2005). Consequently, firms pursue REM in the interest of their managers who suffer severe personal consequences when falling short of the market's earnings expectations. Amongst these consequences is a significant decrease in income due to the common practice of stock-based compensation to be based more on short-term stock prices (Currim et al. 2018), as well as there are reputational losses with negative consequences for their career (Schulz and Wiersema 2018). On the other hand – and still consistent with agency theory –

REM can also be interpreted as shareholder value-enhancing and therefore as a favorable outcome from a shareholder's perspective. Managers' tendency to engage in empire building, e.g., by pursuing excessive growth or excessive investment, is well established in research (see Hope and Thomas 2008). Likewise, this behavior is motivated by managers' affection for power, compensation, and prestige (Hope and Thomas 2008). Consequently, managers' reaction to pursue REM in response to earnings pressure can be interpreted as an efficient monitoring mechanism that stems managers' tendency to overinvest for self-maximizing reasons (Dong et al. 2021; Zhang and Gimeno 2010). To solve this theoretical interpretation ambiguity in terms of REM of IT investments, it is necessary to examine its performance consequences to determine if intervention and thus an adjustment of current corporate governance systems is necessary.

Hypotheses

Building on behavioral agency theory, we argue that performance shortfalls, as reflected by earnings pressure, lead firms to reduce IT investments in order to reduce current period's expenses and increase earnings. Since "[…] managers both talk more about and spend more money on what is important to them […]" (Steelman et al. 2019) pursuing REM of IT investments, i.e., altering the timing or structuring of real IT-related business operations (Xue et al. 2021), is likely reflected in a reduction of both budgetary and verbal commitment to IT. We conceptualize IT investment commitment as the emphasis on IT investments within firms' public disclosure (Steelman et al. 2019). Consequently, we formulate the following hypothesis:

Hypothesis 1: Earnings pressure has a negative impact on subsequent IT investment commitment.

The REM of IT investments taking place under earnings pressure is per se neither good nor bad. On the one hand, it can be argued that firms reducing IT investments under earnings pressure suffer from lower long-term performance if it distracts managers from pursuing long-term investments by forcing them to increase short-term earnings (Rappaport 2005). On the other hand, it can be argued that firms reducing IT investments under earnings pressure benefit from higher long-term performance if this reduction is the result of external monitoring that curtails the overinvestments managers pursue in their strive to build empires (Zhang and Gimeno 2010). In other words, earnings pressure can either mitigate an overinvestment in IT (i.e., value-enhancing) or aggravate underinvestment in IT (i.e., value-destroying). As it is essential to analyze the performance consequences to understand which interpretation is more appropriate, we formulate the following alternative hypotheses:

Hypothesis 2a: Firms that show greater commitment to IT investments under earnings pressure throughout earlier periods have higher long-term stock performance.

Hypothesis 2b: Firms that show lower commitment to IT investments under earnings pressure throughout earlier periods have higher long-term stock performance.

Method

The data were compiled from several secondary data sources: Thomson Reuters Eikon/Datastream, Institutional Brokers Estimate System (I/B/E/S), Standard & Poor's CapitalIQ, Kenneth R. French's and Bill McDonald's website. Our sample is built from all publicly traded U.S. firms accessible via these sources. The final sample comprises 6,851 firm-year observations of 997 firms covering 15 years from 2005 to 2019.

IT investment commitment (ITIC). We measure IT investment commitment based on the ratio of IT-related mentions from firms' annual reports as prior research shows that they capture the extent to which firms engage in IT activities (Havakhor et al. 2020; Steelman et al. 2019). With this approach, we build on prior research showing that organizational commitment to IT can be captured in terms of verbal or budgetary commitment (Steelman et al. 2019). We retrieved the keyword dictionary from Steelman et al. (2019) which includes words or n-grams such as "information technology" or "digital" and the specific technologies from the *InformationWeek* surveys corresponding to the years 2000-2007. To account for the emergence and diffusion of new technologies, we extended the dictionary by including the technologies listed on the Gartner Hype Cycle Emerging Technologies since 2008 as keywords. 10-K filings are received from Bill McDonald via the "Software Repository for Accounting and Finance"-website of the University of Notre Dame, which are parsed in order to remove extraneous materials (e.g., HTML tags). Further, sentences including one of the IT-related keywords and one of the terms "investment", "invested", "invest" or "invests" are counted in order to increase the specificity of the retrieved proxy. Conclusively, ITIC is calculated as the number of identified sentences scaled by total sentences in the filing, multiplied by 1000.

Earnings Pressure (EP). Earnings pressure theoretically represents the gap between analysts' consensus earnings forecast (F) and management's expectations about the company's potential earnings (Zhang and Gimeno 2010). As managers do not regularly announce their earnings expectations, and because they might attempt to guide analysts' forecasts downwards by disclosing pessimistic expectations, managers' public guidance is neither broadly available nor an unbiased proxy for their expected potential earnings (Zhang and Gimeno 2010). Therefore, Zhang and Gimeno (2010) employed Matsumoto's (2002) measure to estimate the "expected forecast" as a proxy for management's expectations about companies' potential earnings (E[EPS]). We adopt this approach to operationalize earnings pressure:

$$Earnings\ pressure_{it} = (F_{it} - E[EPS_{it}]) \,/\, Stock\ Price_{it-1}$$

Both, the proxy for potential earnings by Matsumoto (2002) and the operationalization of earnings pressure by Zhang and Gimeno (2010) are well established in accounting and management literature (Zhang and Gong 2018). A detailed technical description of its calculation can be found in Currim et al. (2018) and the Appendix of Zhang and Gimeno (2010). As the earnings pressure measure is calculated at the beginning (i.e., ex-ante) of the period prior to any alteration of business decisions, it is neither subject to reverse causality nor suffers from endogeneity issues connected to accountings earnings management or earnings guidance (Zhang and Gimeno 2016). Also, the estimation of potential earnings is not a mere extrapolation of past earnings but also includes recent stock market returns (Currim et al. 2018). Therefore, new market information like changes in the external environment (e.g., unfavorable market conditions) and internal operational issues are included (Currim et al. 2018). Figure 1 depicts an exemplary timeline of events and illustrates the inherent lag contained in the earnings pressure measure.

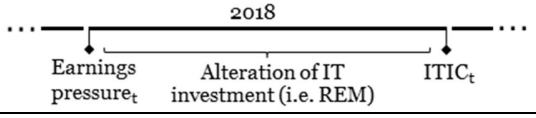

Figure 1. Exemplary Timeline

Control variables. First, when testing for the influence of earnings pressure on subsequent IT investments, we include a broad set of control variables that state an alternative use of funds (Xue et al. 2021). These are (1) *R&D expenditures (R&D)*, (2) *advertising expenditures,* and (3) *capital expenditures (CAPX)* scaled by total assets. Since firms are only required to report substantial R&D and advertising expenditures, data is not available for all observations. Following prior research, we coded missing R&D and advertising values as zero and included dummy variables coded 0 when data was available and 1 otherwise (Benner and Ranganathan 2012). Second, we include a dummy capturing *industry IT intensity* to control for heterogenous IT needs across industries. IT needs are presumably higher in IT-intensive industries, i.e., industries where firms' revenue-generating core business is more reliant on IT investments, for example to facilitate innovation (see Kobelsky et al. 2008; Xue et al. 2021). Therefore, firms in IT-intensive industries might be less inclined to reduce IT investments under earnings pressure. We adopted three alternative classifications based on SIC codes from prior literature to capture this concept. Within our main analysis, we use the "technology firm"-classification developed by Chen and Srinivasan (2019) in order to identify firms operating in industries directly relating to computers, electronics, communications, data processing, and internet services (SICs: 3570, 3571, 3572, 3575, 3576, 3577, 3661, 3663, 3669, 3670, 3672, 3674, 3677, 3678, 3679, 4812, 4813, 4899, 7370, 7371, 7372, 7373, 7374, 7377). Within our supplemental analyses, we use the classification by Yayla and Hu (2011) (*industry IT intensity 2*) which is more inclined towards firms offering computer-related services like software (SICs: 7371 to 7379) and the classification employed by Bharadwaj et al. (2009) (*industry IT intensity 3*) covering the three industries with the highest average IT spending (SICs: 4800 to 4899, 6211 to 6799 and 6000 to 6159). Third, we also include an extensive set of lagged control variables capturing firm characteristics that are likely or have been shown to be determinants of IT investments (Kobelsky et al. 2008; Xue et al. 2021): (1) *Size*, measured as the natural logarithm of employees to control for economies of scale; (2) *market-to-book (MTB)* ratio, defined as the ratio of firms' market value of assets to their book value to control for investment opportunity, since having more opportunities to invest is a key determinant of corporate investment (Zhang and Gong 2018); (3) *debt*, operationalized as total debt divided by total assets to control for constraints in investment budgets resulting from interest payments; (4) *sales growth*, calculated as the natural logarithm of sales growth rate in the past year; (5) *size growth*, calculated as the natural logarithm of employee growth rate in the past year; (6) *industry-adjusted return-on-assets (adj. ROA)*, calculated as a firm's ROA less the four

digit SIC industry-average ROA to control for a firm's ability to invest in IT based on their profitability; (7) *cash*, calculated as the ratio of cash and equivalent by total assets. Fourth, we also control for *analyst coverage*, measured as the number of analysts contributing to the consensus forecast as analyst coverage might also influence firms' capability to conduct strategic investments (Benner and Ranganathan 2012).

Empirical Model. Given the nature of our data, we adopt dynamic longitudinal panel estimators to analyze the effect of earnings pressure (EP) – for firm i in year t – on IT investment commitment (ITIC) while controlling for the earlier specified set of control variables (Z), as well as firm (μ) and time-fixed (τ) effects. Specifically, IT investments are likely intertemporally correlated since IT investment decisions in a respective period influence the realized IT investments in the upcoming period. For example, certain IT investments that are delayed may increase expenses in the subsequent period (Xue et al. 2021) or the implementation of an IT investment is planned and pursued over multiple periods and therefore drives expenses over several consecutive periods. Therefore, we include a firm's IT investment commitment in the previous year as a control variable. Our linear dynamic panel data model takes the following form:

$$ITIC_{it} = \beta_0 + \beta_1 EP_{it} + \delta ITIC_{it-1} + \gamma_k Z_{i,t} + \tau_t + \mu_i + \varepsilon_{it} \quad (1)$$

Applying ordinary least squares to a model including individual-specific effects and the lagged dependent variable renders the retrieved estimates inconsistent since $ITIC_{it-1}$ is also a function of the individual-specific effect μ_i and thereby endogenous (Roodman 2009). Therefore, equation (1) is first-differenced:

$$\Delta ITIC_{it} = \beta_0 + \beta_1 \Delta EP_{it} + \delta \Delta ITIC_{it-1} + \gamma_k \Delta Z_{i,t} + \Delta\tau_t + \Delta\varepsilon_{it} \quad (2)$$

which eliminates individual-specific effects and allows, for example, the usage of $\Delta ITIC_{it-2}$ as natural in-sample instruments for $\Delta ITIC_{it-1}$ (Roodman 2009). We estimate our model employing a two-step system generalized method of moments (SGMM) approach. Specifically, we employ forward orthogonal deviations to maximize sample size (Roodman 2009). Further, we conduct a Windmeijer correction to receive cluster-robust standard errors. $ITIC_{it-1}$ is included as an endogenous variable and lags 2 and longer are used as instruments. R&D, advertising and capital expenditures are included as predetermined variables and lags 1 and longer are used as instruments. In both cases, this procedure is consistent with the proposed standard treatment for SGMM regression in literature (Roodman 2009; Steelman et al. 2019). Additionally, we conduct a series of specification tests reported in the results section. First, to ensure consistency we test the prevalence of first-order autocorrelation and the absence of second-order autocorrelation employing AR(1) and AR(2) tests. Second, we deploy the Hansen test of overidentifying restrictions (Roodman 2009).

Preliminary Results

Descriptive statistics and pairwise correlations are presented in Table 1. Mean and standard deviations are largely consistent with prior research (Havakhor et al. 2020; Xue et al. 2021). On average, approximately 1.7‰ of the sentences in a firm's annual report emphasize IT investments. Earnings pressure exerted on firms was on average 5.3% of stock price. Correlations between ITIC as well as EP and the controls are mostly significant which highlights the importance to control for differences in firms' characteristics. High correlations between *R&D* and *size* (-0.444) and *R&D* and *adjusted ROA* (-0.536) are in accordance with prior literature (Havakhor et al. 2020) or due to construction (e.g., between *industry IT intensity* controls).

Table 2 Model 1 reports the regression results with only control variables included. In Model 2 earnings pressure is added. H1 proposes a negative impact of earnings pressure on ITIC. Supporting H1, we find a statistically significant negative impact on ITIC (b = -0.042, p < 0.05). The results indicate that an increase in earnings pressure by 1% ceteris paribus is associated with a decrease in ITIC by 0.042‰. The economic magnitude of this effect is significant since it accounts for 2.49% (= 0.042 / 1.686) of average ITIC in the sample. Further, firms' ITIC is significantly positively associated with *lagged ITIC* (b = 0.729, p < 0.01), *industry IT intensity* (b = 0.571, p < 0.01), *size* (b = 0.068, p < 0.01), *MTB* (b = 0.039, p < 0.01) and *size growth* (b = 0.115, p < 0.1). Models 3 and 4 show the results of our supplemental analyses applying two alternative *industry IT intensity* classifications which are qualitatively identical besides showing slightly significant associations of ITIC with some additional controls. The AR(1) test for first-order autocorrelation rejects the null hypothesis of no first-order autocorrelation (Model 2: z = -6.17, p < 0.01), as expected. The AR(2) test for second-order autocorrelation does not reject the null hypothesis of no second-order autocorrelation (Model 2: z = -0.60, p > 0.1), as required for consistency of SGMM. The Hansen J test does not reject the null hypothesis of joint validity of the instrument set (Model 2: χ^2 = 853.76, p > 0.1), indicating the validity of instruments. Specification test results are qualitatively identical for Models 1, 3, and 4.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. ITIC	1																
2. EP	-0.029*	1															
3. R&D	-0.041*	-0.007	1														
4. R&D Dummy	-0.086*	0.012	-0.295*	1													
5. Advert.	0.051*	-0.003	-0.049*	0.098*	1												
6. Advert. Dummy	-0.195*	0.010	0.100*	-0.002	-0.327*	1											
7. Industry IT int.	0.357*	-0.004	0.008	-0.238*	0.035*	-0.143*	1										
8. Industry IT int. 2[2]	0.447*	-0.009	-0.003	-0.105*	0.121*	-0.191*	0.553*	1									
9. Industry IT int. 3[3]	0.127*	-0.008	-0.050*	0.124*	0.023	-0.082*	0.191*	-0.056*	1								
10. CAPX	-0.109*	-0.019	-0.155*	0.211*	-0.006	0.063*	-0.153*	-0.145*	0.033*	1							
11. Size	0.169*	0.003	-0.389*	0.297*	0.041*	-0.151*	0.047*	0.038*	0.084*	0.072*	1						
12. MTB	0.104*	-0.065*	0.279*	-0.163*	0.079*	-0.064*	0.023	0.117*	-0.087*	-0.085*	-0.101*	1					
13. Debt	-0.033*	0.047*	0.059*	0.156*	0.016	0.037*	-0.155*	-0.097*	0.119*	0.053*	0.109*	-0.034*	1				
14. Sales Growth	0.000	-0.016	0.006	-0.038*	-0.003	0.005	-0.025*	0.006	0.003	0.016	-0.033*	0.111*	0.032*	1			
15. Size Growth	0.052*	-0.072*	-0.089*	-0.035*	0.023	-0.038*	0.033*	0.053*	0.014	0.029*	0.077*	0.135*	-0.093*	0.209*	1		
16. Adj. ROA	-0.019	-0.066*	-0.607*	-0.022	0.004	-0.062*	-0.066*	-0.063*	-0.016	-0.011	0.176*	0.004	-0.140*	0.154*	0.139*	1	
17. Cash	0.007	-0.005	0.370*	-0.302*	0.035*	0.057*	0.131*	0.094*	-0.084*	-0.253*	-0.422*	0.192*	-0.158*	0.008	-0.079*	-0.119*	1
18. Anal. Coverage	0.164*	-0.031*	-0.141*	0.033*	0.013	-0.084*	0.051*	0.025*	0.057*	0.156*	0.549*	0.087*	0.076*	0.007	0.022	0.130*	-0.206*
Mean	1.686	0.053	0.092	0.323	0.007	0.630	0.333	0.149	0.018	0.046	7.911	2.889	0.217	0.087	0.047	0.033	0.165
Std. Dev.	2.753	0.487	0.216	0.468	0.027	0.483	0.471	0.356	0.132	0.058	2.034	2.292	0.244	0.442	0.246	0.299	0.160

N=6,851; * denotes significance at the 5% level or below; [2] Following Yayla and Hu (2011); [3] Following Bharadwaj et al. (2009).

Table 1. Descriptive Statistics and Pairwise Correlations

	Model 1		Model 2 Main Results		Model 3 Supplemental Analysis[2]		Model 4 Supplemental Analysis[3]	
Earnings Pressure			-0.042**	(-0.019)	-0.042**	(-0.019)	-0.045**	(-0.019)
$ITIC_{t-1}$	0.729***	(-0.029)	0.729***	(-0.029)	0.712***	(-0.034)	0.752***	(-0.026)
R&D	-0.026	(-0.050)	-0.024	(-0.050)	-0.057	(-0.051)	-0.085	(-0.057)
Advertising	-0.604	(-0.924)	-0.6	(-0.928)	-1.437	(-0.918)	-0.093	(-0.842)
R&D Dummy	-0.065	(-0.105)	-0.052	(-0.104)	-0.048	(-0.099)	-0.261**	(-0.104)
Advertising Dummy	-0.033	(-0.145)	-0.029	(-0.144)	0.007	(-0.140)	-0.047	(-0.145)
CAPX	-0.62	(-0.507)	-0.647	(-0.507)	-0.969*	(-0.512)	-0.899*	(-0.518)
Industry IT intensity	0.570***	(-0.087)	0.571***	(-0.087)	1.048***	(-0.144)	0.757**	(-0.305)
$Size_{t-1}$	0.069***	(-0.017)	0.068***	(-0.017)	0.064***	(-0.016)	0.087***	(-0.017)
MTB_{t-1}	0.039***	(-0.012)	0.039***	(-0.012)	0.025**	(-0.010)	0.036***	(-0.013)
$Debt_{t-1}$	-0.035	(-0.106)	-0.033	(-0.105)	-0.049	(-0.109)	-0.190**	(-0.094)
Sales $Growth_{t-1}$	-0.003	(-0.019)	-0.004	(-0.019)	-0.008	(-0.019)	-0.005	(-0.020)
Size $Growth_{t-1}$	0.116*	(-0.061)	0.115*	(-0.061)	0.104*	(-0.059)	0.108*	(-0.063)
Adj. ROA_{t-1}	-0.059	(-0.092)	-0.072	(-0.094)	-0.06	(-0.079)	-0.200**	(-0.100)
$Cash_{t-1}$	0.06	(-0.141)	0.057	(-0.141)	0.077	(-0.139)	0.18	(-0.144)
Analyst Coverage	0.004	(-0.004)	0.004	(-0.004)	0.007*	(-0.004)	0.004	(-0.004)
Constant	-0.493**	(-0.198)	-0.490**	(-0.201)	-0.367*	(-0.196)	-0.327*	(-0.197)
Year Fixed Effects	Inlcuded		Included		Included		Included	
Model Fit	χ^2 = 6520.96***		χ^2 = 6552.85***		χ^2 = 6665.41***		χ^2 = 6887.09***	
AR(1) Test	z = -6.16***		z = -6.17***		z = -6.08***		z = -6.20***	
AR(2) Test	z = -0.60 (n.s.)		z = -0.60 (n.s.)		z = -0.61 (n.s.)		z = -0.59 (n.s.)	
Hansen J Test	χ^2 = 854.71 (n.s.)		χ^2 = 853.76 (n.s.)		χ^2 = 863.98 (n.s.)		χ^2 = 852.86 (n.s.)	
No. of Observations	6,851		6,851		6,851		6,851	
No. of Groups	997		997		997		997	

[1] Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01; [2] Employs *Industry IT intensity 2*; [3] Employs *Industry IT intensity 3*.

Table 2. System GMM Regression for the Effect of Earnings Pressure on ITIC

Discussion and Conclusion

This study examines the relationship between IT investments and earnings pressure. Our preliminary results show that earnings pressure is associated with a reduction in firms' IT investment commitment, based on the frequency of sentences within 10-K filings emphasizing IT investments, indicating that firms might reduce IT investments when they are under earnings pressure. With this study, we aim to make three contributions. First, based on our preliminary findings, we provide initial empirical evidence that identifies earnings pressure as a potential determinant of IT investments. This is an important insight as it shows the

role capital markets might play in the genesis of REM of IT investments. Specifically, we highlight the role earnings forecasts published by analysts play in the context of IT investment decisions, which potentially are linked to a reduction of the same. Therefore, our findings are consistent with Xue et al. (2021) who find that IT investments are likely subject to REM.

Second, we use behavioral agency theory to explain IT investment decisions as a result of performance falling short of aspirational levels and conflicting interests between owners and managers. This perspective states a relatively new approach in research on the determinants of IT investments (Dong et al. 2021). Considering performance shortfalls as represented by backward-looking performance measures (i.e., ROA), Dong et al. (2021) argue that firms respond by increasing IT investment to close this performance gap. We contribute to this theoretical framework by introducing considerations and first empirical indications for an opposing effect of performance shortfalls on IT investment. That is, we show that performance falling short of a forward-looking and short-term aspirational level (i.e., analysts' consensus forecast) is potentially associated with a reduction of IT investments. This finding is in line with accounting and management research observing REM in order to meet analysts' consensus forecast (e.g., Graham et al. 2005; Zhang and Gong 2018). Additionally, we propose to interpret these opposing findings as rather complementary than contradictory. In essence, managers likely consider short-term and long-term aspirational performance levels simultaneously and eventually IT investments are determined in a trade-off between both.

Finally, we plan to contribute to the resolution of the interpretation ambiguity of REM of IT investments that occurs under agency theoretic considerations. Therefore, we will analyze whether the reduction of IT investment commitment under earnings pressure relates to lower or higher subsequent stock market performance. Positive performance consequences would point to a reduction of IT investments of questionable future value and indicate a monitoring role of the expectations set on the capital market. Still, a better alignment of managerial and shareholder interests through governance mechanism, for example in terms of the compensation scheme, should be aspired in order to stem overinvestment and empire building. For example by reducing the proportion of stock options in CEO compensation, as recent findings point to a positive relationship between stock options and IT overinvestment (Ravichandran and Zhao 2018). Negative performance consequences would point to a reduction of IT investments, despite their future value for firms. This would imply that short-term earnings targets set by the capital market distract managers from value-enhancing long-term investments. In this case, boards should consider governance mechanisms that insulate managers from earnings pressure or decrease their ability to pursue discretionary alterations of IT investments. For example, decentralizing decision rights in terms of IT investments potentially has an attenuating effect on REM of IT investments (Xue et al. 2021).

Limitations & Further Proceedings

Since this study is research in progress, it is subject to several limitations. We currently plan to address the following issues in further progress: First, we plan to extend the empirical analysis to cover H2. Therefore we have adopted the "measure of past commitment to marketing spending under analysts' pressure" (Currim et al. 2018) and will analyze whether firms resisting to reduce IT investment commitment under earnings pressure entail lower or higher (1) stock market performance as measured by compounded abnormal stock return (CAR) (following Mizik 2010) and (2) earnings performance (e.g., ROA). Second, we plan to address a differentiation between different types of IT investments (e.g., investments in current or new IT, software, hardware, etc.) based on our proxy and potential additional IT spending data. Third, we plan to analyze heterogeneity in terms of the effect of EP on ITIC across industries.

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