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Abstract: Outsourcing is an important strategic decision of high-tech firms. However, while the research has extensively studied the implications of outsourcing to high-tech clients, its impact on high-tech vendors remains underexplored. This study empirically estimates the impact of government outsourcing contracts on high-tech vendors. Employing the earnings-return analyses framework, we find that, for high-tech vendors engaged in government outsourcing contracts, the stock market places a higher value on each unit of unexpected earnings compared to other firms. Additionally, this impact becomes stronger for contracts with longer terms, for contracts outsourced by the U.S. government or by countries with better political and economical stability. We obtain causal evidence through difference-in-differences (DID) analyses of high-tech firms' initiations of government contracts. Mechanism analyses uncover two primary drivers behind this impact: increased persistence of future earnings and improved alignment between accrual earnings and cash flows. Overall, our research indicates that when valuing high-tech firms, the stock market incorporates information from supply-chain networks, especially that related to government customers. Our results underscore the importance of obtaining government outsourcing contracts for high-tech firms' managers. Becoming a vendor to the government helps a high-tech firm reduce the uncertainty faced by its outside investors, who in turn value the high-tech firm's earnings to a greater extent.

Keywords: High-tech, IT firms, outsourcing, government contracts, firm value, firm earnings, earnings-return framework

1. Introduction

High-tech firms wield a profound and enduring influence on business operations. Projections indicate that by 2030, the global high-tech market could surge to a staggering USD$16 trillion [11]. Outsourcing activities in high-tech industries, spanning software system development to research and development (R&D), have witnessed remarkable growth over the past two decades, primarily owing to advancements in communication and collaboration technologies [50]

The strategic decisions made by firms to outsource pivotal business functions like R&D and product development stand as paramount determinants of contemporary corporate triumph [1, 37]. Delving into such decisions holds theoretical significance, as outsourcing involves the fundamental question of firm boundaries, often referred to as the "theory of the firm" according to Coase [15]. The extensive body of literature has scrutinized the ramifications of outsourcing on client firms, exemplified by the comprehensive review of Tsay et al. [63]. On a positive note, research underscores that outsourcing can enhance clients' gross margins [4]. However, it is essential to acknowledge the potential downsides, as outsourcing has been associated with increased coordination costs, quality lapses, and diminished economic performance [52, 60]. A more balanced perspective is presented by Mani et al. [45], who argue that the economic implications of outsourcing for a client are intricately shaped by the design of the outsourcing contract.

This rich strand of literature notwithstanding, there are surprisingly few studies exploring the implications of outsourcing to a vendor firm, that is, the recipient of outsourced business functions. However, this issue should not be overlooked as the transaction cost economics, which serves as the underlying theoretical ground for outsourcing, contends that the characteristics of any economic exchange such as outsourcing are shaped by both parties' incentives [67, 68]. To fill this research gap, this paper explores the consequence of outsourcing to high-tech vendors.[i]

Specifically, we analyze whether a high-tech vendor's outsourcing engagement with government clients impacts the stock market's valuation of its earnings. Such an approach differs from the existing literature in two important ways. First, while previous studies largely focus on the project- or contract-level implications of outsourcing, our study intends to obtain firm-level strategic insights by exploring the link between outsourcing and share prices. Such an issue is important because key personnel of high-tech firms (e.g., chief information officers [CIOs], information technology (IT) managers, and chief executive officers [CEOs]) pay close attention to share prices to learn relevant information for their decision-making [31], and also because they hold sizable stock-based compensations [58]. Second, while previous research has studied public or private clients in general, our study focuses on a special type of clients—government entities—and brings an unexplored and interesting perspective to the outsourcing literature.

We approach the research question by focusing on the high uncertainties of high-tech firms, shaped by following unique features: (1) their dynamic and intensely competitive product markets that introduce product market uncertainty [5, 26], (2) their supply chains that face higher disruption risks than non-high-tech industries [64], and (3) their high growth opportunities that are more difficult to value than assets-in-place [10].

We hypothesize that, when a high-tech vendor enters into outsourcing contracts with government clients, the stock market assigns a higher value to each unit of its earnings. It is widely recognized that firm valuation equals the present value of future cash flows [54]. Government outsourcing contracts increase the vendor's level and persistence of cash flows for two primary reasons. First, the coercive powers linked to regulation, taxation and other similar measures enhance a government's financial stability and reduce bankruptcy risk [23, 24]. Consequently, a vendor firm is more likely to receive cash flows associated with the government's mandated payments. Second, the greater stability and extended terms inherent in government contracts result in increased persistence of future earnings for high-tech firms [16, 17]. Within the foundational valuation framework, these effects lead to more favorable assessments of high-tech vendors' earning.

To empirically test our hypotheses, we examine the stock market's reaction to the unexpected earnings of high-tech firms. Importantly, we model this reaction as a function of whether a high-tech firm secures outsourcing contracts from a government. By constructing a dataset comprising 1,890 U.S. high-tech firms listed on NYSE, Nasdaq and Amex for 2007-2015, we document a stronger market reaction to unexpected earnings for high-tech vendors with government outsourcing contracts than for those without. Our main finding suggests that government outsourcing enhances the stock market's valuation of high-tech vendors.

Subsequently, we conduct additional analyses to fortify our central argument. First, we consider the characteristics of governments' outsourcing contracts. Contracts with longer terms should be more likely to generate persistent earnings for a high-tech firm. Furthermore, a firm that has just initiated a contract outsourced by a government will benefit more from the contract than firms with older contracts because the new contract has more remaining years. Our cross-sectional analyses corroborate these predictions. The positive impact of government outsourcing contracts on the earnings-return relation becomes more pronounced when an outsourcing contract has a longer term or when a high-tech firm is in the first year of the contract.

Second, we examine whether institutional attributes of the outsourcing countries change the implication of government contracts. We assert that, given investors' heightened focus on local information over non-local data, contracts outsourced by the U.S. government will exert a more pronounced influence on the earnings response coefficient (ERC) of U.S. firms compared to non-U.S. government contracts. Additionally, the political and economic stability of the outsourcing countries enhances investors' trust in future cash flows stemming from government contracts, thereby amplifying the impact of these contracts on ERCs. Empirical analyses robustly substantiate these claims.

To address the potential endogeneity that firms with government outsourcing contracts can be different from firms without such contracts [22, 36], we conduct a DID analysis around high-tech firms' initiations of government contracts. We find that high-tech firms' ERCs become higher in the period after they initiate government contracts. Importantly, this increase in ERC surpasses the changes observed in non-initiating high-tech firms. These empirical results establish a compelling causal inference, reaffirming our core finding that investors accord higher value to the abnormal earnings of high-tech firms when they are engaged in government outsourcing contracts.

To explore the mechanisms driving the main effect, we delve into two specific aspects of a firm's earnings: (1) earnings volatility and (2) the connection between earnings and cash flows. If government contracts provide stable and long-term future revenue, then earnings volatility will be lower for high-tech firms with government contracts. Furthermore, if the government has better solvency and lower bankruptcy risk, earnings under accrual accounting, an accounting standard mandated across the world, are more likely to turn into realized cash flows.[ii] Our empirical findings are consistent with both predictions.

Our study makes three distinct contributions to the existing literature. First, we enrich the research landscape within information systems and operations management concerning outsourcing. While the conventional literature has predominantly focused on the ramifications of outsourcing for the client firm [4, 44, 45, 48, 60], which is the outsourcing firm itself, we adopt a unique vantage point by examining the implications for vendor firms, which are the recipients of outsourcing contracts. Our research establishes operational and valuation consequences for vendor firms when they engage in long-term outsourcing agreements with government agencies.

Second, we address the call for research on the theory of firm (ToF) in Tsay et al. [63]. Our study investigates vendor firms that extend their firm boundaries by procuring contracts from government agencies. We demonstrate that such economic exchanges exert a significant influence on the future prospects of high-tech vendors, which is evident in the stock market's heightened responsiveness to these firms' operating earnings.

Last, we contribute to the field of research on the valuation of high-tech firms. Despite their paramount significance, high-tech firms encounter considerable challenges in the valuation process, primarily due to the inherently risky nature of their operations [1, 5, 26, 37]. Our research illuminates how information within the supply chain can facilitate the valuation process. More precisely, government outsourcing contracts endow high-tech firms with more enduring future earnings and smoother transitions from earnings to cash flows. These economic dynamics manifest in stronger earnings-valuation relationships, meaning that investors place greater value on the earnings of high-tech firms when these firms have government customers.

Literature Review and Hypothesis Development

Related Literature of Outsourcing in High-Tech Industries

Our work is closely related to the growing body of studies on issues of outsourcing in the high-tech industry. The important stream of research in this area has focused on contract design such as the choice of payment type, that is, time-and-material (T&M) contracts versus fixed-price contracts [33, 34, 38], and contract extensiveness [6, 13, 47]. Gopal et al. [34] empirically show that vendor-, client-, and project-related characteristics such as requirement uncertainty and project team size explain contract choice in these projects; furthermore, contract choice and team size affect project profit. Through textual analysis of IT outsourcing contracts, Chen and Bharadwaj [13] examine how transaction characteristics such as outsourcing relationships affect contract provisions and how such an effect varies with pricing conditions. Benaroch et al. [6] view design choices of extensiveness and contract type as complementing and substituting for each other in minimizing total transaction costs. Tiwana and Kim [61] use survey data to study when and how concurrently outsourcing and insourcing IT activities enhance IT performance.

Notably, all these previous studies have focused on the individual project level. Differently, we study the impact of outsourcing contracts at the firm level and provide high-level strategic insights for high-tech vendors. More specifically, we intend to address high-tech vendors' valuation by examining the implication of engaging in government outsourcing contracts.[iii] This firm-level insight is important to explore for following reasons.

First, valuation of high-tech firms is important to the research community of information systems. CIOs, IT managers and CEOs pay close attention to share prices due to following reasons: (1) share prices feedback signals for their decision-making [31], and (2) they hold equity-based compensations (e.g., through stock grants or stock options in their compensations) whose values are directly associated with share prices [58]. Notably, as high-rank executives or employees, CIOs, IT managers, and CEOs are key decision-makers when applying for and receiving government outsourcing contracts.

Second, valuation constitutes arguably the most important issue to a high-tech firm's investors from whom the firm raises its capital. These investors make valuation decisions based on publicly-available information that we observe, that is, disclosures of government outsourcing contracts.

Hypothesis Development

Our conceptual framework hinges on the important and unique features of high-tech firms which result in their high uncertainties [12, 14, 39, 62]. First, the product market for high-tech firms tends to be dynamic and intensely competitive, inducing higher product market uncertainty [5, 26]. Second, the supply chain that a high-tech firm resides in faces a higher disruption risk than that of other industries [64]. Third, high-tech firms on average have more growth opportunities than non-high-tech firms, and growth opportunities, in contrast to assets in place (such as plants and machineries), are more difficult to value [3, 10]. Therefore, the nature of operations and business conditions associated with high-tech firms results in their high uncertainties, rendering government outsourcing a potentially important signal in the valuation process.

To examine valuation implications of government outsourcing to high-tech vendors, we employ the earnings-return framework, developed in the accounting and finance literature [25, 40]. The standard earnings-return framework models a firm's stock price as a function of its periodic earnings. Such a framework stems from the theoretical foundation that the equity value (i.e., share price) equals the present value of discounted future cash flows during a firm's entire life cycle [19, 54]. Furthermore, outside investors require value-relevant information (e.g., earnings in this context) in their decision making [51, 53, 69]. Therefore, share price has a positive and strong link with a firm's earnings. The linear association between unexpected earnings and abnormal stock returns during a short window surrounding the earnings announcement date is termed the *Earnings Response Coefficient* (or *ERC*). Since its introduction into the empirical capital market research, the earnings-return framework has been widely adopted in empirical research addressing how information attributes or firm attributes impact investors' pricing of corporate earnings (e.g., recent studies include Li [42], Wei and Zhang [66]).[iv]

We incorporate high-tech vendors' government-outsourcing contracts into the earnings-return framework. We argue that a high-tech firm has lower operational uncertainty when its revenue is mainly from contracts outsourced by a government. Coercive powers associated with regulation, taxation and other measures provide a government with better solvency and lower bankruptcy risk [23, 24]. The greater stability and longer terms characterizing government outsourcing contracts translate into a high-tech firm's greater persistence in future earnings and a better mapping between earnings and cash flows [16, 17].

Furthermore, at the contract level, government contracts also exhibit features that may induce stronger investor reactions to firms' unexpected earnings. By offering favorable adjustments such as cost-plus terms and inflation adjustments [9, 57], government contracts are more likely to yield long-term benefits for firms. For example, Berrios [8] finds that the U.S. government increasingly uses the cost-plus contracts. Furthermore, government contracts are also likely to overpay relative to non-government contracts. Collectively, these forces lead investors to perceive earnings associated with firms' government contracts to be more reliable, resulting in stronger share price reactions to firms' earnings surprises.

Drawing upon the preceding discussion, we hypothesize that the earnings of high-tech firms engaged in government outsourcing contracts hold a higher valuation in the eyes of the stock market compared to their counterparts. This effect is expected to materialize in the form of an enhanced ERC for high-tech firms with government clients. We state our main hypothesis as follows.

(H1): High-tech firms' stock prices react to their earnings to a greater extent when they have government outsourcing contracts.

Our primary hypothesis, H1, pivots on the premise that high-tech firms holding government outsourcing contracts likely enjoy a future earnings trajectory characterized by reduced uncertainty. If this premise holds true, we anticipate a duration effect. A high-tech firm embarking on a longer-term contract with a government should benefit from an extended period of stable earnings stemming from that government contract. Conversely, a high-tech firm with a shorter-term contract specified in the contract is likely to experience a weaker effect of the government outsourcing contract on stock price reactions to its unexpected earnings. We predict that the positive association between ERC and the presence of government outsourcing contracts becomes more pronounced when the outsourcing contract has a longer term or when a high-tech firm is within the first year of the contract. We formulate our second hypothesis as follows:

(H2): The impact of government outsourcing on high-tech vendors' earnings-return association is greater when the contract term is longer or when the earnings announcement lies in a contract's initiation year.

Furthermore, we posit that the impact of government contracts on ERC can be influenced by the outsourcing countries and their institutional characteristics. To begin, we draw a distinction between contracts outsourced by the U.S. government and those by non-U.S. governments. The concept of investors' local preference, supported by a substantial body of literature, suggests that investors tend to view domestic entities as more familiar and trustworthy than foreign counterparts [18]. Given our analysis within the U.S. capital market, where the primary investors are based in the U.S., we hypothesize that investors in our sample are inclined to perceive U.S. government contracts as more likely to yield reliable economic benefits than non-U.S. government contracts.

Second, we delve into the institutional attributes of countries that could influence their political and economic stability. High stability of a country, both politically and economically, enhance contract enforcement and reduce uncertainty. Therefore, when a government contract is outsourced by a country boasting a more stable political and/or economic environment, we predict that the capital market will place a greater emphasis on the cash flow streams derived from that contract. We formulate our third hypothesis as follows.

(H3): The effect of government outsourcing on high-tech vendors' earnings-return association is greater when the outsourcing government is local (i.e., U.S.), or has stronger economical and political stabilities.

Lastly, we explore mechanisms that can lend further support to our main hypothesis. We consider two mechanisms that plausibly mediate the positive association between government outsourcing and ERC. First, we expect that engaging in government outsourcing enhances earnings persistence (or diminishes earnings volatility) for high-tech firms in the long term. In their earnings-return framework, Easton and Zmijewski [25] propose that ERCs increase in the association between current earnings and future earnings. With greater earnings persistence, investors are more likely to use current earnings as a reliable indicator of future earnings, thereby influencing share prices. We contend that government outsourcing contracts improve high-tech firms' earnings persistence [16, 17].

Second, we predict high-tech firms engaging in government outsourcing to have higher-quality earnings compared to their counterparts. As a high-tech firm embarks on an outsourcing contract, it continuously generates revenue, causing accrual earnings (i.e., revenues earned during the current or prior periods) to accumulate. However, the corresponding cash flows materialize only when its client remits payment to the high-tech firm. The connection between cash flow and accrual earnings hinges on the ability of a client to fulfill its payment obligations.[v] We argue that, given the higher credibility and financial stability of governments as counterparties in outsourcing contracts [23, 24], the reported earnings of high-tech firms with government outsourcing contracts under the accrual-accounting system exhibit a more robust alignment with cash flows. Thus, H4 encompasses these two mechanisms:

(H4): High-tech firms engaging in government outsourcing contracts exhibit (1) lower earnings volatility, and (2) better connection between accrual earnings and cash flows than other firms.

Data, Sample, and Measurement

Data and Sample

Following Francis and Schipper [29] and Bowen et al. [10], we identify high-tech firms based on their three-digit SIC codes. Our sample comprises of the following high-tech industries (SIC codes): drugs (283), computer and office equipment (357), electrical machinery and equipment (360), electrical transmissions and distribution equipment (361), electrical industrial apparatus (362), household appliances (363), electrical lightning and wiring equipment (364), household audio, video equipment, audio receiving (365), communication equipment (366), electronic components, semiconductors (367), telephone communications (481), computer programming, software, data processing (737), and research, development, testing services (873).

From the public database *Factset*, we obtain original data on government outsourcing contracts to U.S. listed firms for the period of 2007-2015. This dataset provides the following information for each outsourcing contract: identities of the contracting parties (firms and government agencies), the nationality of the government agency, the beginning and ending dates of the contract, and other related information. Such information allows us to determine whether a high-tech firm has an existing government outsourcing contract on the earnings announcement date. For example, we observe that the U.S. Department of Energy outsourced a contract to IBM, initiating on March 25, 2015. Our manual search returns IBM's press release describing further details of this contract. On November 14, 2014, IBM announced that the U.S. Department of Energy awarded the firm a contract valued at $325 million with the objective of developing and delivering the world's most advanced "data centric" supercomputing systems. In the dataset, U.S. government/states outsourced the most contracts, 526, accounting for 65.18 percent of all contracts outsourced to our sample firms (807). Leading non-U.S. governments include the United Kingdom (43), Australia (23), and China (21).

Our empirical analyses focus on the stock market's valuation of high-tech firms' earnings and whether such valuation differs for firms with, and firms without, government outsourcing contracts. To this end, we obtain annual earnings announcement information from the Institutional Broker's Estimate System (I/B/E/S), a database widely used in research of earnings announcements [10, 40]. We collect data on a firm's announced earnings per share (EPS) and the mean analyst forecast of EPS as of the most recent I/B/E/S statistical period date (STATPERS). Furthermore, we require STATPERS to be within 30 days prior to the earnings announcement date to ensure that we capture the recent market expectation of a firm's EPS. Such information allows us to compute the unexpected earnings (i.e., earnings surprises). We merge this dataset with stock price information from the Center for Research in Security Prices (i.e., CRSP) and firm fundamental data in the financial statements from the Compustat database. Our final sample contains 8,174 earning announcement events for 1,890 unique high-tech firms during 2007-2015.

Table 1 Panel A presents the sample breakdown by industries and each industry's proportion of firms with government outsourcing contracts. Computer programming, software, data processing has the most observations (2,566), while electrical machinery and equipment (e.g., computers) has the least observations (25). Notably, high-tech industries exhibit sufficient variation in their propensity to have government outsourcing contracts, ranging from 5.56 percent of the household appliances industry to 24.32 percent of the communication equipment industry.

Measurement of Key Variables

In this section, we describe our construction of key empirical variables. Because our analyses mainly examine stock price reactions to earnings surprises, we identify the unexpected earnings component for each annual earnings announcement event. For each event, we construct unexpected earnings as a firm's realized EPS minus analysts' consensus regarding EPS prior to the announcement. We measure analysts' consensus by employing the mean forecast of a firm's EPS in the I/B/E/S summary file, with the mean value taken as the numeric average of each individual analyst's most recent forecast prior to the earnings announcement month. Because EPS and stock price share the same basis (i.e., both are affected by a firm's number of shares outstanding), we follow the literature norm and scale unexpected earnings by share price at the end of day -2, that is, two days prior to the earnings announcement [25, 40]. In each cross-section, we rank firms into deciles based on the scaled unexpected earnings (*ES*) constructed above. *Rank(ES)* denotes this decile rank. Such an ordinal variable construction has several advantages [43]. First, this construction reduces

Table 1. Summary Statistics[a]

Industries	SIC3	Observations	Average *GOV* (Percent)
Panel A: Industry Breakdown of The Empirical Sample[b]			
Drugs	283	2,422	12.14
Computer and Office Equipment	357	565	23.72
Electrical Machinery and Equipment (exc. Computers)	360	25	24.00
Electrical Transmissions and Distribution Equipment	361	51	17.65
Electrical Industrial Apparatus	362	136	21.32
Household Appliances	363	36	5.56
Electrical Lightning and wiring Equipment	364	62	16.13
Household Audio, Video Equipment, Audio Receiving	365	38	21.05
Communication Equipment	366	440	24.32
Electronic Components, Semiconductors	367	1,300	13.69
Telephone Communications	481	394	8.88
Computer Programming, Software, Data Processing	737	2,566	18.16
Research, Development, Testing Services	873	139	16.55

Variables	N	Mean	Std Dev	25 Percent	Median	75 Percent
Panel B: Summary Statistics of Empirical Variables[c]						
Ret (-1, 1)	8,174	0.197	10.687	-5.056	0.006	5.128
BHRet (-1, 1)	8,174	0.160	10.687	-5.138	-0.074	5.016
CAR (-1, 1)	8,174	0.011	10.454	-5.108	-0.225	4.946
Rank (ES)	8,174	4.786	2.923	2.000	5.000	7.000
GOV	8,174	0.159	0.366	0	0	0
MCAP	8,174	6.499	1.932	5.127	6.275	7.662
LOSS	8,174	0.449	0.497	0	0	1.000
BTM	8,174	0.449	0.639	0.188	0.350	0.611
LEVERAGE	8,174	0.121	0.188	0	0.012	0.183
BIG4_AUDITOR	8,174	0.791	0.406	1.000	1.000	1.000

[a]This table presents sample breakdown, summary statistics. [b]Panel A reports the industry breakdown of the sample. For each industry, we report the number of observations (*Observations*) and the percentage of observations with government contracts (Average *GOV*). [c]Panel B reports the summary statistics of main empirical variables. Detailed variable definitions are outlined in Appendix 1.

measurement errors in a continuous measure of unexpected earnings. Second, this construction facilitates the economic interpretation of stock price reactions to earnings surprises.[vi]

To evaluate investors' reactions to unexpected earnings, we follow the prior literature [28, 40] and construct alternative measures of stock returns surrounding the earnings announcement dates. *RET* (-1, 1) is the cumulative daily return (i.e., sum of three daily returns) during the three-day window, with the earnings announcement date as day 0. *BHRET* (-1, 1) is the holding period return during the three-day window.[vii] Our final measure of stock returns computes abnormal stock returns, that is, filtering out the expected stock returns for a stock during the same period. Specifically, *CAR* (-1, 1) is the cumulative daily return during the three-day window minus the cumulative value-weighted market return during the same period. We display these measures in percentage terms, that is, multiplied by 100. We employ alternative measures of stock price reactions to ensure that our conclusions are insensitive to computational methods or the benchmarks of expected returns.

Finally, we distinguish firm-years with and without government outsourcing contracts by linking this earnings announcement sample to our data on government outsourcing contracts. By utilizing information on the beginning and ending dates of each contract, we are able to determine whether a firm's earnings announcement date lies within a period when the firm has a government outsourcing contract. We construct the indicator *GOV*, which equals one if a firm has an existing contract outsourced by a government agency and zero otherwise. Such a construct creates both cross-sectional and time-series variation in firms' incidences of receiving government outsourcing contracts. Table 1 Panel B presents summary statistics of empirical variables. Online Supplemental Appendix reports their correlation coefficients (OA1).

Empirical Fndings

Government Outsourcing and Stock Price Reaction to High-Tech Firms' Unexpected Earnings

To test our main hypothesis (H1), we estimate the following regression model:

$$\begin{aligned} & Stock\ Return(-1,1)_{i,t} = \alpha_0 + \alpha_1 \times Rank(ES)_{i,t} + \alpha_2 \times GOV_{i,t} + \alpha_3 \times Rank(ES)_{i,t} \times GOV_{i,t} \\ & + Control\ Vars + Industry\ FEs + Year\ FEs + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where *Stock Return* (-1,1) measures a firm's stock return during the three-day window around its earnings announcement date, taking one of the three alternative measures: *RET* (-1,1), *BHRET* (-1,1), and *CAR* (-1,1). *Rank(ES)* is the decile rank of a firm's earnings surprise scaled by the share price at day -2. Finally, *GOV* identifies whether a firm-year has a government contract. A positive association between stock return and *Rank(ES)* suggests favorable market reactions to positive earnings surprises. More importantly, we predict a positive coefficient of *Rank(ES)*×*GOV*, implying that high-tech firms with government contracts exhibit higher ERCs.

We also included control variables that may affect stock price reactions to corporate earnings. As the prior research argues and shows that ERCs are associated with firm size, risk, and growth [21, 25], we control for interactions between *Rank(ES)* and following variables: the natural logarithm of a firm's market capitalization (*MCAP*), the ratio of book value of equity to market capitalization (*BTM*)—growth firms exhibit lower *BTM* ratios, and the ratio of long-term debt to total assets (*LEVERAGE*)—higher leverage suggests higher firm risk. As loss firms exhibit lower ERCs due to investors' liquidation options [35, 40], we further incorporate an indicator for losses (*LOSS*).[viii] Finally, as the major preparer for firms' financial reporting, auditors exert significant impact on the credibility of reported earnings to investors, thus shaping the latter's response to earnings information [65]. We construct an indicator that equals one if a firm hires a Big 4 auditor and zero otherwise (*BIG4_Auditor*). We include these variables and their interaction terms with *Rank(ES)*. Finally, we control for fixed effects for years and industries, and cluster standard errors by firms to address potential serial correlations in the error terms.

Table 2 reports our main finding. Consistent with our prediction, the coefficient of the interaction term *Rank(ES)*×*GOV* is positive and statistically significant in all three specifications. In Column (1), where *RET* (-1, 1) is the dependent variable, the coefficient equals 0.271 (*se* = 0.131). Such a result is also economically sizable. Comparing a firm in the top *Rank(ES)* group (with *Rank(ES)* = 9) with a firm in the bottom *Rank(ES)* group (with *Rank(ES)* = 0), the difference in their three-day stock returns will be 2.44 percent (=0.271*(9-0)) greater if the firms source revenue from

Table 2. Government Outsourcing and Valuations of High-tech Vendors' Earnings[a]

Dependent Variables=	*Ret* (-1,1)	*BHRet* (-1, 1)	*CAR* (-1, 1)
	(1)	(2)	(3)
Rank(ES)	1.249***	1.270***	1.279***
	(0.201)	(0.201)	(0.198)
*Rank(ES)*GOV*	0.271**	0.275**	0.236*
	(0.131)	(0.130)	(0.128)
GOV	-1.269*	-1.247*	-1.077
	(0.674)	(0.663)	(0.660)
*Rank(ES)*MCAP*	-0.024	-0.024	-0.031
	(0.029)	(0.029)	(0.029)
MCAP	0.183	0.195	0.199
	(0.144)	(0.142)	(0.140)
*Rank(ES)*LOSS*	-0.399***	-0.402***	-0.383***
	(0.097)	(0.097)	(0.095)
LOSS	1.022**	1.031**	0.898*
	(0.517)	(0.513)	(0.508)
*Rank(ES)*BTM*	-0.038	-0.027	-0.061
	(0.065)	(0.063)	(0.063)
BTM	0.029	0.036	0.268
	(0.355)	(0.339)	(0.335)
*Rank(ES)*LEVERAGE*	-0.089	-0.098	-0.081
	(0.273)	(0.267)	(0.269)
LEVERGAE	0.828	0.881	0.845
	(1.347)	(1.320)	(1.299)
*Rank(ES)*BIG4_AUDITOR*	-0.173	-0.197*	-0.159
	(0.114)	(0.113)	(0.112)
BIG4_AUDITOR	1.238**	1.360**	1.207**
	(0.575)	(0.570)	(0.562)
Industry, Year Fixed Effects	Yes	Yes	Yes
Observations	8,174	8,174	8,174
R-squared	0.056	0.057	0.056

[a]This table presents the effect of government outsourcing on valuations of high-tech vendors' earnings. *RET* (-1,1) is the cumulative daily return during the three-day window with earnings announcement date as day 0, in percentage terms; *BHRET* (-1,1) is the holding period return during the three days window with earnings announcement date as day 0, in percentage terms; and *CAR* (-1,1) is the cumulative daily return during the three-day window with earnings announcement date as day 0, subtracted by the cumulative value-weighted market return during the same period, in percentage terms. *Rank*(*ES*) is the decile rank of a firm's earnings surprise scaled by price on day -2. We perform yearly rank of firms' earnings surprises. Standard errors reported in parentheses are robust to heteroskedasticity and clustered by firm. *, **, and ***, denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Detailed variable definitions are outlined in Appendix 1.

government outsourcing contracts. In Columns (2) and (3) where we employ alternative measures of stock returns, we obtain estimates that are qualitatively similar and economically comparable. Combined, the empirical findings support our main hypothesis (H1) that high-tech firms with government outsourcing contracts receive more (less) favorable stock market reactions to their positive (negative) earnings surprises.

Regarding control variables, we find that loss firms have lower ERCs. This finding is consistent with earlier studies which show that losses incur weaker price reactions than profits [35, 40]. There is no consistent evidence that other firm attributes significantly impact the ERCs in our context.[ix]

Heterogeneity Effects Based on Contract Characteristics

Contract Duration

In this section, we test H2 which predicts that high-tech firms will experience a stronger effect of government contracts in either of the following two situations:1) such contracts are long-term, or 2) the contracts just started.

We define the length of a government contract as the number of years between the year of contract initiation and the year of contract end. The median value of government contract length equals five. We then decompose *GOV* into two indicators: (1) *GOV_Long* equals one if the government contract's length is greater than or equal to the median length, and zero otherwise; and (2) *GOV_Short* equals one if the government contract's length is shorter than the median length, and zero otherwise. We then estimate Eq. (2):[x]

$$\begin{aligned} & Stock\ Return(-1,1)_{i,t} = \alpha_0 + \alpha_1 \times Rank(ES)_{i,t} + \alpha_2 \times GOV_{i,t} \\ & +\alpha_3 \times Rank(ES)_{i,t} \times GOV\_Long_{i,t} + \alpha_4 \times Rank(ES)_{i,t} \times GOV\_Short_{i,t} \\ & +Control\ Vars + Industry\ FEs + Year\ FEs + \varepsilon_{i,t}, \end{aligned} \tag{2}$$

Table 3 Panel A presents the results. In Column (1), the coefficient of *Rank(ES)*×*GOV_Long* is positive and significant (0.368, se = 0.148), suggesting that long-term government contracts increase capital market's reactions to a firm's earnings surprises. Differently, the coefficient of *Rank(ES)*×*GOV_Short* is statistically insignificant (0.216, se = 0.138). Such a result is consistent with the notion that short-term contracts have a limited effect on a firm's future earnings. When we employ the two alternative measures of event-window stock returns in Columns (2) and (3), we obtain similar findings. Overall, compared with short-term contracts, long-term contracts affect a firm's future earnings for a greater number of future years, creating a more pronounced effect of government outsourcing on the stock market reactions to the firm's earnings.

H2 predicts a stronger positive effect of government outsourcing contracts on a high-tech firm's ERC during the contract initiation year. To test this prediction, we decompose *GOV* into two indicators: *GOV_First*, which equals one if the earnings announcement date is within one year of the contract initiation date, and *GOV_NonFirst*, which equals one if the earnings announcement date is within the second year and onwards of the contract. We interact both indicators with *Rank(ES)* and estimate Eq. (3):

$$\begin{aligned} & Stock\ Return(-1,1)_{i,t} = \alpha_0 + \alpha_1 \times Rank(ES)_{i,t} + \alpha_2 \times GOV_{i,t} \\ & + \alpha_3 \times Rank(ES)_{i,t} \times GOV\_First_{i,t} + \alpha_4 \times Rank(ES)_{i,t} \times GOV\_NonFirst_{i,t} \\ & + Control\ Vars + Industry\ FEs + Year\ FEs + \varepsilon_{i,t}, \end{aligned} \tag{3}$$

Table 3 Panel B reports the results. In Column (1), the coefficient of *Rank(ES)*×*GOV_First* is positive and significant (0.300, se = 0.130), while that on *Rank(ES)*×*GOV_NonFirst* is statistically insignificant (0.206, se = 0.163). The empirical results are consistent with our hypothesis H2 that the effect of government outsourcing on high-tech vendors' earnings-return association is greater when the earnings announcement is within the contract initiation year.[xi]

Institutional Attributes of Outsourcing Countries

Our second line of investigation of contract heterogeneity exploits institutional attributes of outsourcing countries. We distinguish contracts outsourced by the United States and non-

Table 3. Heterogeneity Effects based on Contract Characteristics[a]

Dependent Variables=	*Ret* (-1,1)	*BHRet* (-1, 1)	*CAR* (-1, 1)
	(1)	(2)	(3)
Panel A: Heterogeneity Effects – Contract Length[b]			
Rank(ES)	1.241***	1.262***	1.271***
	(0.201)	(0.201)	(0.198)
*Rank(ES)*GOV_Long*	0.368**	0.382**	0.341**
	(0.148)	(0.149)	(0.146)
*Rank(ES)*GOV_Short*	0.216	0.215	0.177
	(0.138)	(0.137)	(0.135)
GOV	-1.262*	-1.241*	-1.070
	(0.675)	(0.664)	(0.661)
Control Variables	Yes	Yes	Yes
Industry, Year FEs	Yes	Yes	Yes
Observations	8,174	8,174	8,174
R-squared	0.057	0.058	0.057
Panel B: Heterogeneity Effects – Contract Initiation Years[c]			
Rank(ES)	1.246***	1.268***	1.278***
	(0.201)	(0.201)	(0.198)
*Rank(ES)*GOV_First*	0.300**	0.305**	0.250*
	(0.130)	(0.129)	(0.128)
*Rank(ES)*GOV_NonFirst*	0.206	0.209	0.205
	(0.163)	(0.164)	(0.160)
GOV	-1.269*	-1.248*	-1.077
	(0.673)	(0.662)	(0.660)
Control Variables	Yes	Yes	Yes
Industry, Year FEs	Yes	Yes	Yes
Observations	8,174	8,174	8,174
R-squared	0.056	0.057	0.056
Panel C: Heterogeneity Effects – U.S. vs non-U.S. Contracts[d]			
Rank(ES)	1.246***	1.267***	1.276***
	(0.201)	(0.201)	(0.198)
*Rank(ES)*GOV_US*	0.299**	0.305**	0.265**
	(0.131)	(0.131)	(0.129)
*Rank(ES)*GOV_NonUS*	0.059	0.048	0.017
	(0.213)	(0.211)	(0.197)
GOV	-1.292*	-1.272*	-1.100*
	(0.673)	(0.662)	(0.659)
Control Variables	Yes	Yes	Yes
Industry, Year FEs	Yes	Yes	Yes
Observations	8,174	8,174	8,174
R-squared	0.057	0.058	0.057
Panel D: Heterogeneity Effects – Countries' Political Stabilities[e]			
Rank(ES)	*1.253****	*1.274****	*1.284****
	(0.201)	*(0.201)*	*(0.198)*
*Rank(ES)*GOV_High_Stability*	*0.282***	*0.286***	*0.247**
	(0.134)	*(0.133)*	*(0.132)*
*Rank(ES)*GOV_Low_Stability*	*0.169*	*0.170*	*0.129*
	(0.185)	*(0.184)*	*(0.172)*
GOV	*-1.283**	*-1.264**	*-1.090*
	(0.678)	*(0.667)*	*(0.664)*
Control Variables	*Yes*	*Yes*	*Yes*
Industry, Year FEs	*Yes*	*Yes*	*Yes*
Observations	*8,171*	*8,171*	*8,171*
R-squared	*0.056*	*0.057*	*0.056*
Panel E: Heterogeneity Effects – Countries' Rules of Law[f]			
Rank(ES)	1.252***	1.274***	1.283***
	(0.201)	(0.201)	(0.198)
*Rank(ES)*GOV_High_Law*	0.284**	0.289**	0.250*
	(0.133)	(0.133)	(0.131)
*Rank(ES)*GOV_Low_Law*	0.110	0.106	0.060
	(0.212)	(0.210)	(0.194)
GOV	-1.290*	-1.271*	-1.097*
	(0.677)	(0.666)	(0.663)

(*Continued*)

Table 3. (Continued).

Control Variables	Yes	Yes	Yes
Industry, Year FEs	Yes	Yes	Yes
Observations	8,171	8,171	8,171
R-squared	0.056	0.057	0.056

[a]This table presents results of heterogeneity effects based on contract characteristics. [b]Panel A analyzes the effect of contract length. *GOV_Long* (*GOV_Short*) is an indicator that equals one if *GOV* equals one and the government contract's remaining length is longer than or equal to (shorter than) the median, and zero otherwise. [c]Panel B analyzes the effect of contract initiation year. *GOV_First* (*GOV_NonFirst*) is an indicator that equals one if *GOV* equals one and the firm is (not) in the government contract's initiation year, and zero otherwise. [d]Panel C analyzes the effect of U.S. government contracts. *Gov_US* (*GOV_NonUS*) is an indicator that equals one if *GOV* equals one and the contract sources from the U.S. government (non-U.S. governments), and zero otherwise. [e]Panel D analyzes the effect of government contracts' sourcing countries' political stabilities. *GOV_High_Stability* (*GOV_Low_Stability*) is an indicator that equals one if *GOV* equals one and the government contract sources from a country with *Political Stability* higher than or equal to (lower than) the median, and zero otherwise. *Political Stability* is measured as the average value of a country's "Political Stability and Absence of Violence/Terrorism" for each country during our sample period, obtained from the World Bank. [f]Panel E analyzes the effect of government contracts' sourcing countries' rules of law. *GOV_High_Law* (*GOV_Low_Law*) is an indicator that equals one if *GOV* equals one and the government contract sources from a country with *Rule of Law* higher than or equal to (lower than) the median, and zero otherwise. *Rule of Law* is measured as the average value of a country's "Rule of Law" for each country during our sample period, obtained from the World Bank. Standard errors reported in parentheses are robust to heteroskedasticity and clustered by firm. *, **, and ***, denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

U.S. governments, respectively. H3 posits that investors should perceive U.S. government contracts to be more likely to yield reliable economic benefits than non-U.S. government contracts.

To address H3, we define two indicators (1) *GOV_US*, which equals one if a contract is outsourced by government agencies of the U.S.; and (2) *GOV_NonUS*, which equals one for non-U.S. governments' contracts. Interacting both indicators with *Rank(ES)*, we estimate a regression similar as the form in Eq. (3), with the interaction terms replaced.

Table 3 Panel C presents the results. We find that the main effect—higher ERCs for vendors with government contracts—only holds for U.S. contracts, but not for non-U.S. contracts. Coefficients on *Rank(ES)*GOV_US* are economically and statistically more significant than those on *Rank(ES)*GOV_NonUS*. In brief, investors of the U.S. market perceive U.S. governments' contracts to be more important than those of other governments.

We also consider countries' institutional attributes that could shape their stability in politics and economic activities. Stronger institutions of a country, politically and economically, improve contract enforcement and reduce uncertainty. Therefore, when a government contract is outsourced by a country with more stable political and/or economical environment, we predict the capital market to put a greater weight on the cash flow streams brought by the contract.

Empirically, we obtain data from the world bank on the following two institutional attributes of countries around the world: (1) *Political Stability*: The score measuring perceptions of the likelihood of political instability and/or politically-motivated violence, ranging from -2.5 to 2.5; and (2) *Rule of Law*: The score measuring perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence, ranging from -2.5 to 2.5. Higher values of *Political Stability* and *Rule of Law* suggest higher political and economical stabilities.

For countries outsourcing the government contracts in our sample, we use the median of *Political Stability* to split the countries and decompose *GOV* into two indicators. *GOV_High_Stability* (*GOV_Low_Stability*) is an indicator that equals one if *GOV* equals one and the government contract sources from a country with *Political Stability* higher than or equal to (lower than) the median. Similarly, we construct the two indicators *GOV_High_Law* and *GOV_Low_Law* based on the variable *Rule of Law*. We then employ the similar econometric approach as Eq. (3) and analyze the heterogeneity effect brought by countries' political stability and rule of law. We find that the positive effect of government contract on ERC is stronger for countries with higher political stability (Panel D) and for countries with stronger rule of law (Panel E).[xii] Overall, empirical evidence supports H3.

Causality: DID Analyses around Contract Initiations

In this section, we seek causal evidence through DID analyses by exploiting firms' initiations of government outsourced contracts. Such a methodology has also been employed in recent IS studies to seek causal evidence [32]. In particular, we construct a sample by pairing high-tech firms that initiate government contracts (i.e., treatment firms) with high-tech firms with similar fundamentals but do not initiate government contracts (i.e., control firms). Then, we examine the impact of government contracts on ERCs for treatment firms and control firms around the treatment firms' contract initiation year.

To conduct this DID analysis, we identify 194 instances where a firm initiated a government contract in year *t*, having not had one in year *t*-1. These events are regarded as contract initiations. For each event, we match it with a control group of firms meeting specific criteria. The control firm should operate within the same industry, devoid of government contracts in both year *t*-1 and year *t*. Moreover, the control firm should possess an identical rank of earnings surprise as the treatment firm in year *t*. We retain observations for both treatment and control firms in year t (the post-initiation year) and year *t*-1 (the pre-initiation year). Subsequently, we conduct DID analyses to ascertain whether the initiation of government contracts leads to an increase in the treatment firm's ERC. The regression equation is as follows.

$$\begin{aligned} &Stock\ Return(-1,\ 1)_{i,t} = \alpha_0 + \alpha_2 \times Rank(ES)_{i,t} \times Post_{i,t} \times Treat_i \\ &+\alpha_3 \times Rank(ES)_{i,t} \times Post_{i,t} + \alpha_4 \times Rank(ES)_{i,t} \times Treat_i + \alpha_5 \times Treat_i \times Post_{i,t} \\ &+ Control\ Vars\ +\ Industry\ FEs\ +\ Year\ FEs\ +\ \varepsilon_{i,t}, \end{aligned} \tag{4}$$

Our variable of interest is the interaction term *Rank(ES)*Post*Treat*. *Treat* is an indicator for treatment firms. *Post* is an indicator for post-initiation observations. If contract initiation causes the vendor firm to experience an increase in its ERC, we expect the coefficient on the interaction to be positive and significant.

Table 4 reports our DID regression results. Across the three specifications with alternative measures of stock returns, we consistently find positive and significant coefficients on *Rank(ES)*Post*Treat*. Such evidence suggests that, after a firm's initiation of government contract, its *ERC* significantly increases in the next year. The evidence here facilitates a causal interpretation and mitigates the endogeneity concern.[xiii]

Comparing treatment and control firms, we find that their firm attributes are quite similar. The percentage difference (mean difference scaled by the treated group's mean) equals 5.24 percent for market capitalization (*MCAP*), -0.24 percent for loss incidences (*LOSS*), 2.28 percent for book to market ratios (*BTM*) and 2.63 percent for Big 4 auditor hiring (*BIG4_AUDITOR*). For firm leverage, however, the percentage difference is greater (22.28 percent). Notably, we have controlled for these variables in our regression analyses. Furthermore, we test the pre-treatment parallel trend assumption by examining whether treatment firms experience a change in ERC relative to control firms during the pre-event year. For both treatment and control firms, we construct a new sample including the two years before the treatment. We then modify our original difference-in-difference regression model by replacing the *Post* indicator with a *Pre* indicator. *Pre* equals one for observations in Year -1 (i.e., one year before treatment), and zero in Year -2. We find that coefficients on *Rank(ES)*Treat*Pre* are insignificant across the three specifications, supporting the parallel trend assumption.

Mechanism Analyses

In this section, we explore the mechanisms through which government contracts increase high-tech vendors' ERCs. H4 predicts that government outsourcing contracts improve the high-tech vendors' earnings persistence and the mapping between accruals and cash flows. We examine H4 empirically.

Table 4. Causality: Difference-in-Differences (DID) Analyses of Contract Initiation on Earnings Response Coefficient (ERC)[a]

Dependent Variables=	*Ret* (-1,1)	*BHRet* (-1, 1)	*CAR* (-1, 1)
	(1)	(2)	(3)
Rank(ES)	1.310***	1.329***	1.316***
	(0.337)	(0.337)	(0.331)
*Rank(ES)*Treat*Post*	0.568*	0.565*	0.539*
	(0.325)	(0.322)	(0.312)
*Rank(ES)*Treat*	-0.081	-0.079	-0.056
	(0.159)	(0.157)	(0.150)
*Rank(ES)*Post*	0.031	0.033	0.026
	(0.059)	(0.060)	(0.058)
*Treat*Post*	-3.099**	-3.044**	-3.115**
	(1.371)	(1.352)	(1.329)
Control Variables	Yes	Yes	Yes
Industry, Year FEs	Yes	Yes	Yes
Observations	5,930	5,930	5,930
R-squared	0.060	0.061	0.061

[a]This table presents results of DID analyses of contract initiations on earnings response coefficients. We identify initiation events wherein the firm have a government contract in year *t*, but not in year *t*-1. For each event, we match with it a control group of firms meeting the following criteria. The control firm should lie in the same industry, and does not have government contracts in both year *t*-1 and year *t*. Furthermore, the control firm should have the same rank of earnings surprise, i.e., Rank(*ES*), as of the treatment firm in year *t*. For both treatment and control firms, we keep their observations in year *t* (the post-initiation year) and year *t*-1 (the pre-initiation year). We then perform the DID (DID) regression. *Treat* is an indicator for treatment firms. *Post* is an indicator for post-initiation observations. Standard errors reported in parentheses are robust to heteroskedasticity and clustered by firm. *, **, and ***, denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Detailed variable definitions are outlined in Appendix 1.

Future Earnings Volatility

To test the association between government outsourcing and earnings volatility, we construct *Std(ROA)* as the standard deviation of annual earnings (income before extraordinary items divided by average total assets) in the subsequent five years. As the earnings volatility captures the second moment of earnings, we require five years to compute its standard deviation and proxy for earnings volatility. We then estimate the following model:

$$Std(ROA)_{i,t} = \alpha_0 + \alpha_1 \times GOV_{i,t} + \ Control\ Vars + Industry\ FEs + Year\ FEs + \varepsilon_{i,t}, \quad (5)$$

Table 5 Panel A reports the regression results. The coefficient of *GOV* is negative and significant (-0.014, se = 0.005 in Column 1), suggesting that high-tech firms with government contracts exhibit less volatile earnings in future years. In Column (2), we alternatively measure the *Std(ROA)* in the following four years and obtain qualitatively similar results.

The above analyses yield an empirical concern that the window of earnings volatility may not map with the contract window. Acknowledging this limitation, we perform additional analyses by improving the mapping between the two windows. We require a treated firm-year to have government contracts in the majority of the earnings volatility construction window, that is, no fewer than three years. For firm-years with government contracts, yet the remaining contract length is too short to meet the above criteria, we drop such observations. Using this restricted sample, we perform the analyses and present the results in Columns (3) and (4). We consistently find negative and significant coefficients on *GOV*. The combined results suggest that firms with government outsourcing contracts have significantly lower future earnings volatility.

Mapping Accrual Earnings to Cash Flows

To test the prediction that government contracts improve the mapping of accrual earnings to cash flows, we examine whether high-tech vendors with government contracts exhibit less discretionary accruals. Intuitively, a firm's discretionary accrual measures the part of accrual earnings that cannot be mapped to historical, current and future cash flows. Empirically, we measure discretionary accrual using the following model proposed by Dechow and Dichev [20]:

$$TCA_{i,t} = \alpha_0 + \alpha_1 \times CFO_{i,t-1} + \alpha_2 \times CFO_{i,t} + \alpha_3 \times CFO_{i,t+1} + \ \mu_{i,t,} \quad (6)$$

where *TCA* is the total current accruals, calculated as $\Delta CA - \Delta CL - \Delta CASH + \Delta STDEBT$; *TCA* represents a firm's non-cash income; ΔCA is the change in current assets; ΔCL is the change in current liabilities; $\Delta CASH$ is the change in cash; and $\Delta STDEBT$ is the change in debt in current liabilities. On the right-hand side of Eq. (6), *CFO* is the cash flow from operations and μ_{it} is the regression residual. All variables are scaled by a firm's total assets as of year *t*-1. Subscripts *i* and *t* denote firm and year, respectively. We estimate the model for each industry-year and define the absolute value of the residual μ_{it} as $ABS(DA_{original})$. A higher value of $ABS(DA_{original})$ suggests a greater magnitude of accrual earnings that cannot be mapped to cash flows. In the Online Supplemental Appendix, we discuss fundamental concepts of accrual accounting to facilitate a better understanding of our accounting items (OA2)

Table 5. Government Outsourcing and Future Earnings Volatility[a]

Sample requirement=	No Restriction		≥3 Years of Remaining Contract	
Dependent Variables=	*Std(ROA) 5 Years*	*Std(ROA) 4 Years*	*Std(ROA) 5 Years*	*Std(ROA) 4 Years*
	(1)	(2)	(3)	(4)
Panel A: Government Outsourcing and Future Earnings Volatility[b]				
GOV	-0.014***	-0.014**	-0.012**	-0.012*
	(0.005)	(0.006)	(0.006)	(0.007)
MCAP	-0.014***	-0.014***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)	(0.002)
BTM	-0.039***	-0.039***	-0.040***	-0.041***
	(0.006)	(0.007)	(0.006)	(0.008)
LOSS	0.047***	0.046***	0.049***	0.048***
	(0.005)	(0.005)	(0.005)	(0.006)
LEVERGAE	-0.045*	-0.029	-0.043*	-0.026
	(0.025)	(0.030)	(0.026)	(0.031)
BIG4_AUDITOR	-0.010	-0.009	-0.010	-0.009
	(0.010)	(0.011)	(0.010)	(0.011)
Industry, Year FEs	Yes	Yes	Yes	Yes
Observations	3,829	3,296	3,546	3,047
R-squared	0.310	0.298	0.313	0.302

Dependent Variables=	*Abs(DA_Original)*	*Abs(DA_Modified)*
	(1)	(2)
Panel B: Government Outsourcing and The Mapping of Accrual Earnings and Cash Flows[c]		
GOV	-0.009***	-0.010***
	(0.003)	(0.002)
MCAP	-0.007***	-0.006***
	(0.001)	(0.001)
BTM	-0.015***	-0.013***
	(0.003)	(0.003)
LOSS	0.025***	0.025***
	(0.003)	(0.003)
LEVERGAE	-0.016**	-0.015**
	(0.007)	(0.007)
BIG4_AUDITOR	-0.004	-0.004
	(0.003)	(0.003)
Industry Effects	Yes	Yes
Year Effects	Yes	Yes
Observations	6,818	6,794
R-squared	0.130	0.133

Dependent Variables=	*Bad Debt Percentage*	
Timing of the Dep. Var.=	Current Year	Next Year
	(1)	(2)
Panel C: Government Outsourcing and Bad Debt Reserves[d]		
GOV	-0.011**	-0.011*
	(0.005)	(0.006)
MCAP	-0.003**	-0.004***
	(0.001)	(0.002)
BTM	0.010	0.019**
	(0.008)	(0.009)
LOSS	0.014**	0.005
	(0.007)	(0.006)
LEVERGAE	-0.025**	-0.039**
	(0.011)	(0.020)
BIG4_AUDITOR	-0.001	-0.010
	(0.008)	(0.010)
Industry Effects	Yes	Yes
Year Effects	Yes	Yes
Observations	6,038	5,640
R-squared	0.024	0.026

[a]This table presents results of mechanism analyses. [b]Panel A estimates the effect of government outsourcing on high-tech vendors' future earnings volatility. *Std(ROA) 5 Years* is computed as the standard deviation of a firm's annual return-on-

Alternatively, we follow McNichols [46] and Rajgopal and Venkatachalam [56] by enhancing Eq. (6) with two terms: (1) annual change in revenue ΔREV_{it} and (2) the value of property, plant and equipment PPE_{it}, with both measures scaled by total assets. We estimate Eq. (7) below and define the absolute value of the residual as $ABS(DA_{modified})$:

$$TCA_{i,t} = \alpha_0 + \alpha_1 \times CFO_{i,t-1} + \alpha_2 \times CFO_{i,t} + \alpha_3 \times CFO_{i,t+1} + \alpha_4 \times REV_{i,t} + \alpha_5 \times PPE_{i,t} + \mu_{i,t}, \quad (7)$$

We then test the association between government outsourcing and discretionary accruals:

$$\begin{aligned} &ABS\left(DD_{original}\right)_{i,t} or\ ABS\left(DD_{modified}\right)_{i,t} \\ &= \alpha_0 + \alpha_1 \times GOV_{i,t} + Control\ Vars + Industry\ FEs + Year\ FEs + \varepsilon_{i,t}, \end{aligned} \quad (8)$$

The results in Table 5 Panel B report that the coefficients of *GOV* in both specifications are negative and significant. The coefficient equals -0.009 (se = 0.003) when the dependent variable is $ABS(DA_{original})$, and equals -0.010 (se = 0.002) when the dependent variable is $ABS(DA_{modified})$. The results here suggest that firms with government customers exhibit less discretionary accrual earnings that cannot be mapped to cash flows.

Allowances for Doubtful Accounts

In addition to the statistical approach to estimate discretionary accruals, we also examine a firm's allowance for doubtful accounts to gauge the mapping of its accrual earnings and cash flows. A firm's allowance for doubtful accounts, also known as the bad debt reserve, represents the management's expectation of receivables that will not be eventually paid by customers (i.e., becoming cash flows). For example, a company records one million dollars of sales in the current year. Based on historical records or other information of customer payments, the management projects that 2 percent of the total amount will become bad debt. The company will therefore record $20,000 as allowances for doubtful accounts, that is, bad debt reserves.

Empirically, we construct the variable *Bad Debt Percentage* as the amount of a firm's allowance for doubtful receivables, scaled by the firm's total account receivables in the current year. Notably, the analysis of bad debt focuses on the level (first moment) of bad debt reserve. Using a single year (either current year or next year) is therefore ideally suited to analyze this question. We estimate Eq. (9) and report regression results in Table 5 Panel C.

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assets (*ROA*) during the five years subsequent to fiscal year *t*. *Std(ROA) 4 Years* is computed as the standard deviation of a firm's annual return-on-assets (*ROA*) during the four years subsequent to fiscal year *t*. In columns (1) and (2), we impose no restriction on the sample. In columns (3) and (4), we further require a firm-year which has government contract (*GOV* = 1) to have no less than two remaining years in the current contract so as to increase the mapping of the contract and the earnings volatility measurement window. [c]Panel B estimates the effect of the effect of government outsourcing on the mapping of high-tech vendors' accrual earnings and cash flows. $ABS(DA_{original})$ is the absolute value of discretionary accrual earnings estimated from the original Dechow and Dichev [20] model. $ABS(DA_{modified})$ is the absolute value of discretionary accrual earnings estimated from the modified Dechow and Dichev [20] model. Discretionary accrual measures are constructed using financial data as of fiscal year *t*. [d]Panel C estimates the effect of government outsourcing on high-tech vendors' bad debt reserves. *Bad Debt Percentage* is defined as the amount of a firm's allowance for doubtful receivables, scaled by its total account receivables in the current year. In the first column, *Bad Debt Percentage* is measured in the current year. In the second column, *Bad Debt Percentage* is measured in the next year. In all panels, standard errors reported in parentheses are robust to heteroskedasticity and clustered by firm. *, **, and ***, denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Detailed variable definitions are outlined in Appendix 1.

$$Bad\ Debt\ Percentage_{i,t} = \alpha_0 + \alpha_1 \times GOV_{i,t} + \ Control\ Vars + Industry\ FEs + Year\ FEs + \varepsilon_{i,t}, \quad (9)$$

In Column (1) where *Bad Debt Percentage* is measured in the contemporaneous period, we find a negative and significant coefficient of *GOV* (-0.011, se = 0.005). Such a result suggests that firms are less likely to set allowances for bad debt when receivables are more likely to be sourced from government agencies. In Column (2) where *Bad Debt Percentage* is measured in the next year, we again find a negative and significant coefficient of the indicator for government outsourcing (-0.011, se = 0.006). Combined, the empirical findings here suggest that government outsourcing reduces high-tech companies' allowances for bad debt in current and future periods.

Additional Analyses

We perform additional analyses to (1) address how investor composition shapes the main effect, (2) evaluate potential heterogeneity across industries, and (3) ensure robustness of the main finding. We briefly discuss these analyses here and detail them in the Online Supplemental Appendix.

Subsample Analyses Based on Investor Composition and Industry-Government Links

The capacity of investors to acquire and comprehend firm-specific information has important implications for valuations. As a proxy for investor rationality, we rely on a firm's institutional ownership. We find that the main effect primary lies within the subsample of firms with higher levels of institutional ownership. Furthermore, we examine industries' links with the government in obtaining outsourcing contracts, proxied by the number of firms receiving government contracts to proxy for such links. We find that the main effect is predominantly driven by firms in industries with stronger government links (OA3).

Matched Sample Analyses

To further address the concern that firms with government contracts may systematically differ from those without, we perform matched sample analyses by employing: (1) propensity score matching, and (2) industry-size matching. Using the matched samples, we re-perform our main regressions and obtain consistent findings (OA4).

Controlling for Multiple Segments

Large, multi-industry firms may receive contracts that cover different domains. We collect additional data on firms' business segments and control for potential multi-industry effect on the earnings-return association. We find that our main results continue to hold (OA5 Panel A).

Previous Government Contracts

We find that the main effect holds for high-tech vendors engaging in government outsourcing contracts regardless of whether they previously have government contracts. There is some weak evidence of a greater effect for firms without previous contracts (OA5 Panel B).

Intensity of Government Contracts

We incorporate the intensity of government contracts. As data limitation prevents us from obtaining information of monetary amounts, we consider contract numbers and contract years. We find that the effect of government contract on ERC holds for both high-intensity and low-intensity firms (OA5 Panel C). However, the lack of monetary amount might be critical in driving the empirical results and therefore we suggest caution in results interpretation.

Results of Non-High-Tech Firms

Our research question is suitable for high-tech industries due to their unique features that impose significant valuation uncertainties. For non-high-tech industries, we expect a weaker effect of government outsourcing on capital market valuation with regard to corporate earnings. We estimate Model (1) for a sample of firms outside the selected high-tech industries. We do not find a significant effect of government outsourcing on capital markets' valuation of corporate earnings (OA5 Panel D).

Discussion

Implications for Managers and Investors

Our empirical findings provide important managerial insights for high-tech firms. We show that obtaining government outsourcing contracts could help a high-tech firm reduce its operating uncertainty perceived by outside investors, that is, its capital provider. Equally important, the provisions and attributes of contracts serve as important moderators for the aforementioned effect. First, seeking longer contracts further improves the stability of future earnings. Second, contracts outsourced from local governments yield a more beneficial effect due to less information problems for local investors. Third, contracts from governments with higher institutional quality present more credence to high-tech firms' investors.

Notably, an important caveat deserves equal attention from managers. That is, high-tech vendors should possess the proper capability to successfully manage outsourcing contracts. High-tech vendors could suffer significant financial losses and/or reputational damage if government outsourcing contracts go wrong, as evidenced by recent failures of IT outsourcing projects [2, 49]. Langer and Mani [41] find that formal control is critical in shaping vendor's performance in outsourcing contracts. We suggest that high-tech firms' managers should also attend to firms' internal governance practices to ensure desirable outcomes achieved through government outsourcing contracts.

Limitations and Future Research

By extending our study, several areas of future research could emerge. First and foremost, a logical area to explore next is to study the allocation decisions of government outsourcing contracts in this important sector (i.e., high-tech firms). Why do government agencies outsource their contracts to selected high-tech vendors, instead of their peer firms? Evidence of antecedents of government outsourcing has important practical implications as it will inform high-tech managers about how to obtain government outsourcing contracts. As well, such research will make an important contribution to the topic of project management in strategic capacity building, which could increase the probability of obtaining government outsourcing contracts. Furthermore, if high-tech vendors cater to government outsourcing contracts by strategically growing capacity, how will such capacity growth translate into firm growth in the long run? This line of research is highly relevant to research in both the operations management and the information system areas.

Notably, our study limits the analyses to equity holders of high-tech vendors. Future research can examine the impact of government outsourcing on other important stakeholders, such as employees and creditors. Do employees of high-tech vendors also benefit from persistent cash flows brought about by government outsourcing contracts? Does government outsourcing also reduce bond holders' required interest rates or increase a high-tech vendor's credit ratings? Related evidence from the perspectives of internal and external stakeholders can draw a more complete picture of why and how government outsourcing impacts high-tech vendors.

Conclusion

We delve into the valuation implications of government outsourcing for high-tech vendors. Leveraging a comprehensive dataset comprising government contracts and corporate annual earnings announcement events, we unveil a compelling relationship: the extent to which investors assign value to high-tech vendors' abnormal earnings is notably higher when these vendors derive revenue from government outsourcing contracts. Furthermore, such an effect becomes stronger for longer contracts and for contracts outsourced by governments that are local or that exhibit robust economic and political stability.

We uncover two underlying mechanisms supporting our primary result. Firstly, government outsourcing increases the earnings persistence of high-tech vendors. Secondly, government outsourcing leads to an improved alignment between accounts receivables and cash flows for high-tech vendors.

Collectively, our findings imply that the financial stability and low bankruptcy risk linked to government entities wield a significant impact on how the stock market assesses the earnings surprises of high-tech firms. Remarkably, our research breaks new ground by empirically demonstrating that equity investors take into account information from high-tech firms' supply-chain networks, particularly data pertaining to government customers, including their solvency, when evaluating the earnings of high-tech firms.

Notes

1. The issue is important to high-tech vendors. For example, in April 2016, SpaceX received an award of $82.7 million contract from the U.S. Air Force to send a satellite into space. Prior to receiving this award, Elon Musk, CEO of SpaceX, fought hard for the right the bid for the contract as it would provide a new revenue stream for SpaceX and beat Boeing-Lockheed's long-time dominance in the field of military launches. Furthermore, for our empirical sample of 8,174 high-tech firm-years, 15.9 percent of them have government contracts.
2. Under accrual accounting, a firm's reported revenue recognizes accruals defined as value increases that are not cash flows [54]. The most common revenue accruals are receivables (e.g., sales on credit). This accrual component is part of a firm's earnings, but may not result in cash flows, should

a customer default on its obligation. Generally Accepted Accounting Principles (GAAP) in the United States, along with accounting standards for most countries around the world, mandate accrual accounting for firms when preparing financial statements. By contrast, cash accounting records revenue on the condition that cash is received.

3. Although some previous literature has explored the impact of government contracts on firm valuations, our work differs from them by (1) examining the earnings-return association, and (2) by focusing on high-tech firms. For example, Esqueda et al. [27] find that government contractors have lower valuations (proxied by Tobin's Q) than non-contractors. They further show that, although contractors do enjoy lower costs of capital, they suffer from lower future growth. Notably, our study differs from Esqueda et al. [27] in that we examine shareholders' reactions to earnings announcement. This empirical framework allows us to address the issue that, for the same unit of current earnings, whether contractors and non-contractors are perceived differently by shareholders. Glegg et al. [30] find that having the government as a client shapes the supplier firm's accounting choices. More specifically, due to regulatory scrutiny, the supplier firm is more likely to use real earnings management (e.g., abnormal expenditures, abnormal production costs) than using accrual earnings management.
4. Li [42] finds that when earnings information suggests lower future cash flows or greater risks, the earnings response coefficient is lower. Wei and Zhang [66] show that when investors have lower trust for a company's earnings number, the earnings response coefficient is lower.
5. Schilit and Perler [59] describe the typical financial shenanigans of U.S. corporations. The authors note various methods employed by these firms to report misleading accounting earnings under accrual accounting, such as: (1) recording revenue too soon (e.g., Computer Associates), (2) recording bogus revenue (e.g., AIG), and (3) boosting income using one-time or unsustainable activities (IBM).
6. Beneish and Harvey [7] find that the earnings-return relation is approximately linear for small changes but is "S" shaped globally; such nonlinearity is largely caused by measurement errors. A ranking procedure can significantly reduce the impact of measurement errors in the continuous variable. Livnat and Mendenhall [43] further note that "To address the existence of outliers and nonlinearities in the earnings surprise-return relation, most drift studies classify firms into 10 portfolios based on *SUE* (standardized unexpected earnings)" (p. 186).
7. The cumulative daily return measure *RET* (-1, 1) poses fewer statistical problems compared with the compounded buy-and-hold return *BHRET* (-1, 1) [28]. However, the buy-and-hold return has its advantage in that it is the return experienced by an investor. Fama [28] shows that the two measures often draw different inferences in empirical studies and we employ both to seek robustness in our results.
8. Hayn [35] contends that investors can choose to liquidate a firm when expecting continued losses in the future, thus lowering the persistence of firm losses and investors' responses to current-period loss, i.e., lower ERCs.
9. Our firm-level empirical approach yields the interesting issue of potential non-linearity in the effect of having multiple contracts within a firm-year. In untabulated analyses, we examine whether a vendor firm with an existing government outsourcing contract experiences additional ERC increase when it obtains additional contracts. Employing a difference-in-differences specification, we find no evidence of incremental effect, suggesting non-linearity in the association between government outsourcing contracts and ERCs.
10. Rather than interacting the continuous measure of contract length with *Rank(ES)*, we use the decomposition approach. The interaction approach requires the interacting variable to be available for all sample firms, including treated and control firms. However, the control group in our sample does not have government contracts.
11. In the analyses of contract length and contract initiation, we construct our measures based on the contract with the earliest initiation date when a firm has multiple contracts outsourced by the government on the earnings announcement date.
12. For heterogeneity analyses in Table 3, we also perform robustness analyses by controlling for the two new indicators rather than *GOV*. For example, we use *GOV_Long* and *GOV_Short* to

replace *GOV*. We find consistent results from Panel A through Panel E. Therefore, our inferences are not sensitive to this empirical choice. We thank an anonymous reviewer for pointing out this econometric issue.

13. An empirical concern relates to the potential serial correlation in the error terms. Such correlations, if existing and being unaccounted for, would result in inflated *t*-statistics and false significance. In our main analyses, we follow the standard econometric approach to deal with potential serial correlations by clustering standard errors [55]. Furthermore, we construct a subsample wherein the issue of serial correlation is least of a concern. Specifically, we retain observations with only one observation for both the pre-treatment and the post-treatment period. Re-estimating our DID analyses (Eq. 4) using this subsample, we find consistent results – positive and significant coefficients on the interaction term *Rank(ES)*Treat*Post*. We thank an anonymous referee for pointing out this econometric issue.

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References

1. Anand, K.S.; and Goyal, M. Ethics, bounded rationality, and IP sharing in IT outsourcing. *Management Science*, *65*, 11 (2019), 5252–5267.
2. Associated Press. Court: IBM owes Indiana more than $70M in automation dispute. 2019. https://www.ibj.com/articles/74372-court-ibm-owes-indiana-more-than-70m-in-automation-dispute (accessed June 23, 2022).
3. Banker, R.D.; Huang, R.; Natarajan, R.; and Zhao, S. Market valuation of intangible asset: Evidence on SG&A expenditure. *The Accounting Review*, *94*, 6 (2019), 61–90.
4. Bardhan, I.; Mithas, S.; and Lin, S. Performance impacts of strategy, information technology applications, and business process outsourcing in U.S. manufacturing plants. *Production and Operations Management*, *16*, 6 (2007), 747–762.
5. Beckman, S.; and Sinha, K. Conducting academic research with an industry focus: Production and operations management in the high-tech industry. *Production and Operations Management*, *14*, 2 (2005), 115–124.
6. Benaroch, M.; Lichtenstein, Y.; and Fink, L. Contract design choices and the balance of ex ante and ex post transaction costs in software development outsourcing. *MIS Quarterly*, *40*, 1 (2016), 57–52.
7. Beneish, M.; and Harvey, C. Measurement error and nonlinearity in the earnings-returns relation. *Review of Quantitative Finance and Accounting*, *11*, 3 (1998), 219–247.
8. Berrios, R. Government contracts and contractor behavior. *Journal of Business Ethics*, *63*, 2 (2006), 119–130.
9. Berríos, R. Cost and benefit of Ecuador's dollarization experience. *Perspectives on Global Development and Technology*, *51*, 1–2 (2006), 55–68.
10. Bowen, R.; Davis, A.; and Matsumoto, D. Emphasis on Pro Forma versus GAAP earnings in quarterly press release: Determinants, SEC intervention, and market reactions. *The Accounting Review*, *80*, 4 (2005), 1011–1038.
11. Business Wire. Hi-tech market set to reach USD 16 trillion by 2030. 2018. https://www.businesswire.com/news/home/20180919005535/en/Hi-Tech-Market-Set-Reach-USD-16-Trillion (accessed June 23, 2022).

12. Chandrasekaran, A.; Linderman, K.; and Schroeder, R. The role of project and organizational context in managing high-tech R&D projects. *Production and Operations Management*, *24*, 4 (2015), 560–586.
13. Chen, Y.; and Bharadwaj, A. An empirical analysis of contract structures in IT outsourcing. *Information Systems Research*, *20*, 4 (2009), 484–506.
14. Choudhary, V.; Xin, M.; and Zhang, Z. Sequential IT investment: Can the risk of IT implementation failure be your friend? *Information Systems Research*, *34*, 3 (2023), 1017–1044.
15. Coase, R. The nature of the firm. *Econometrica*, *4*, 16 (1937), 386–405.
16. Cohen, D.; Li, B.; Li, N.; and Lou, Y. Major government customers and loan contract terms. *Review of Accounting Studies*, *27*, 1 (2022), 275–312.
17. Cohen, D.A.; and Li, B. Customer-base concentration, investment, and profitability: The U.S. government as a major customer. *The Accounting Review*, *95*, 1 (2019), 101–131.
18. Coval, J., and Moskowitz, T. Home bias at home: Local equity preference in domestic portfolios. *Journal of Finance*, *54*, 6 (1999), 2045–2073.
19. Damodaran, A. *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*, *3rd Edition*. Hoboken, New Jersey, USA: Wiley, 2011.
20. Dechow, P.; and Dichev, I. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review*, *77* (2002), 35–59.
21. DeFond, M.; Erkens, D.H.; and Zhang, J. Do client characteristics really drive the Big N audit quality effect? New evidence from propensity score matching. *Management Science*, *63*, 11 (2017), 3628–3649.
22. Delphine, S. Government procurement and changes in firm transparency. *The Accounting Review*, *96*, 1 (2020), 401–430.
23. Demski, J.S.; and Magee, R.P. A Perspective on accounting for defense contracts. *The Accounting Review*, *67* (1992), 732–740.
24. Dhaliwal, D.; Judd, J.S.; Serfling, M.A.; and Shaikh, S.A. Customer concentration risk and the cost of equity capital. *Journal of Accounting and Economics*, *61*, 1 (2016), 23–48.
25. Easton, P.; and Zmijewski, M. Cross-sectional variation in the stock market response to accounting earnings announcements. *Journal of Accounting and Economics*, *11* (1989), 117–141.
26. Eisenhardt, K.; and Tabrizi, B. Accelerating adaptive processes: Product innovation in The global computer industry. *Administrative Science Quarterly*, *40* (1995), 84–110.
27. Esqueda, O.A.; Ngo, T.; and Susnjara, J. The effect of government contracts on corporate valuation. *Journal of Banking & Finance*, *106* (2019), 305–322.
28. Fama, E. Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics*, *49*, 3 (1998), 283–306.
29. Francis, J.; and Schipper, K. Have financial statements lost their relevance? *Journal of Accounting Research*, *37*, 2 (1999), 319–352.
30. Glegg, C.; Harris, O.; Ngo, T.; and Susnjara, J. Having the government as a client: Does this reduce earnings management of the firm? *Journal of Government and Economics*, *4* (2021), 100022.
31. Goldstein, I. Information in financial karkets and its real effects. *Review of Finance*, *27*, 1 (2022), 1–32.
32. Gong, J.; Liang, Y.; and Ramasubbu, N. Software-vendor diversification: A source of organizational rigidity in adversity? *Journal of Management Information Systems*, *40*, 2 (2023), 338–365.
33. Gopal, A.; and Sivaramakrishnan, K. Research note–on vendor preferences for contract types in offshore software projects: The case of fixed price vs. time and materials contracts. *Information Systems Research*, *19*, 2 (2008), 202–220.
34. Gopal, A.; Sivaramakrishnan, K.; Krishnan, M.S.; and Mukhopadhyay, T. Contracts in offshore software development: An empirical analysis. *Management Science*, *49*, 12 (2003), 1671–1683.
35. Hayn, C. The information content of losses. *Journal of Accounting and Economics*, *20*, 2 (1995), 125–153.
36. Heese, J.; and Perez-Cavazos, G. Fraud allegations and government contracting. *Journal of Accounting Research*, *57*, 3 (2019), 675–719.
37. Huang, H.; Li, Z.; Liu, D., and Xu, H. Auctioning IT contracts with renegotiable scope. *Management Science*, 68, 8 (forthcoming). 6003–6023.

38. Kalnins, A.; and Mayer, K.J. Relationships and hybrid contracts: An analysis of contract choice in information technology. *Journal of Law, Economics, & Organization*, *20*, 1 (2004), 207–229.
39. Kathuria, A.; Karhade, P.P.; Ning, X.; and Konsynski, B.R. Blood and water: Information technology investment and control in family-owned businesses. *Journal of Management Information Systems*, *40*, 1 (2023), 208–238.
40. Keung, E.; Lin, Z.; and Shih, M. Does the stock market see a zero or small positive earnings surprise as a red flag? *Journal of Accounting Research*, *48*, 1 (2010), 91–121.
41. Langer, N.; and Mani, D. Impact of formal controls on client satisfaction and profitability in strategic outsourcing contracts. *Journal of Management Information Systems*, *35*, 4 (2018), 998–1030.
42. Li, B. Separating information about cash flows from information about risk in losses. *Management Science*, *67*, 6 (2021), 3570–3595.
43. Livnat, J.; and Mendenhall, R. Comparing the post-earnings announcement drift for surprises calculated from analyst and time series forecasts. *Journal of Accounting Research*, *44*, 1 (2006), 177–205.
44. Mani, D.; and Barua, A. The impact of firm learning on value creation in strategic outsourcing relationships. *Journal of Management Information Systems*, *32*, 1 (2015), 9–38.
45. Mani, D.; Barua, A.; and Whinston, A.B. Outsourcing contracts and equity prices. *Information Systems Research*, *24*, 4 (2013), 1028–1049.
46. McNichols, M. Discussion of 'The quality of accruals and earnings: The role of accrual estimation errors.'. *The Accounting Review*, *77* (2002), 61–69.
47. Mooi, E.A.; and Ghosh, M. Contract specificity and its performance implications. *Journal of Marketing*, *74*, 2 (2010), 105–120.
48. Moon, S.K.; and Phillips, G.M. Outsourcing through purchase contracts and firm capital structure. *Management Science*, *67*, 1 (2021), 363–387.
49. Moulds, J. IT providers left in the debris of NHS's 'Big Bang'. 2006. https://www.telegraph.co.uk/finance/2948063/IT-providers-left-in-the-debris-of-NHSs-big-bang.html (accessed June 23, 2022).
50. Nirenberg, M. The state of tech staffing: Success tomorrow relies on smart outsourcing today. 2022. https://www.forbes.com/sites/forbesbusinessdevelopmentcouncil/2022/05/06/the-state-of-tech-staffing-success-tomorrow-relies-on-smart-outsourcing-today (accessed June 23, 2022).
51. Pan, Y.; Mithas, S.; Po-An Hsieh, J.J.; and Liu, C.-W. Do risk preferences shape the effect of online trading on trading frequency, volume, and portfolio performance? *Journal of Management Information Systems*, *40*, 2 (2023), 440–469.
52. Parmigiani, A.; Klassen, R.D.; and Russo, M.V. Efficiency meets accountability: Performance implications of supply chain configuration, control, and capabilities. *Journal of Operation Management*, *29*, 3 (2011), 212–223.
53. Peng, J.; Zhang, J.; and Gopal, R. The good, the bad, and the social media: Financial implications of social media reactions to firm-related news. *Journal of Management Information Systems*, *39*, 3 (2022), 706–732.
54. Penman, S. *Financial Statement Analysis and Security Valuation*, *5th Edition*. New York City, New York, USA: McGraw-Hill Education, 2012.
55. Petersen, M.A. Estimating standard errors in finance panel data sets: Comparing approaches. *The Review of Financial Studies*, *22*, 1 (2008), 435–480.
56. Rajgopal, S.; and Venkatachalam, M. Financial reporting quality and idiosyncratic return volatility. *Journal of Accounting and Economics*, *51* (2009), 1–20.
57. Reichelstein, S. Constructing incentive schemes for government contracts: An application of agency theory. *The Accounting Review*, *67*, 4 (1992), 712–731.
58. Richardson, V.J.; Sanchez, J.M.; Setia, P.; and Smith, R. Determinants and consequences of chief information officer equity incentives. *International Journal of Accounting Information Systems*, *31* (2018), 37–57.
59. Schilit, H., and Perler, J. *Financial Shenanigans: How to Detect Accounting Gimmicks & Fraud in Financial Reports*, *3rd Edition*. New York City, New York, USA: McGraw-Hill Education, 2010.

60. Steven, A.B.; Dong, Y.; and Corsi, T. Global sourcing and quality recalls: An empirical study of outsourcing-supplier concentration-product recalls linkages. *Journal of Operation Management 32*, 5 (2014), 241–253.
61. Tiwana, A.; and Kim, S.K. Concurrent IT sourcing: Mechanisms and contingent advantages. *Journal of Management Information Systems*, *33*, 1 (2016), 101–138.
62. Tsai, Y.; Lin, J.Y.; and Kurekova, L. Innovative R&D and optimal investment under uncertainty in high-tech industries: An implication for emerging economies. *Research Policy*, *38*, 8 (2009), 1388–1395.
63. Tsay, A.A.; Gray, J.V.; Noh, I.J.; and Mahoney, J.T. A review of production and operations management research on outsourcing in supply chains: Implications for the theory of the firm. *Production and Operations Management*, *27*, 7 (2018), 1177–1220.
64. Wang, Y.; Li, J.; Wu, D.; and Anupindi, R. When ignorance is not bliss: An empirical analysis of subtier supply network structure on firm risk. *Management Science*, *67*, 4 (2021), 2029–2048.
65. Weber, J.; and Willenborg, M. Do expert informational intermediaries add value? Evidence from auditors in microcap initial public offerings. *Journal of Accounting Research*, *41*, 4 (2003), 681–720.
66. Wei, C.; and Zhang, L. Trust in financial markets: Evidence from reactions to earnings news. *Management Science*, *69*, 10 (2023), 5695–6415.
67. Williamson, O.E. The vertical integration of production: Market failure considerations. *American Economic Review*, *61*, 2 (1971), 112–123.
68. Williamson, O.E. Transaction-cost economics: The governance of contractual relations *Journal of Law & Economics*, *22*, 2 (1979), 233–261.
69. Xu, R.; Chen, H.; and Zhao, J.L. SocioLink: Leveraging relational information in knowledge graphs for startup recommendations. *Journal of Management Information Systems*, *40*, 2 (2023), 655–682.

Appendix 1. Variable Definitions

Variables	Definitions
RET (-1,1)	The cumulative daily return during the three days window with earnings announcement date as day 0. (in percentage).
BHRET (-1,1)	The holding period return during the three days window with earnings announcement date as day 0. (in percentage).
CAR (-1,1)	The cumulative daily return during the three days window with earnings announcement date as day 0, subtracted by the cumulative value-weighted market return during the same period. (in percentage).
Rank(*ES*)	The decile rank of a firm's earnings surprise scaled by price at day -2.
GOV	An indicator that equals one if a firm has an existing contract outsourced by a government agency and zero otherwise.
GOV_Long	An indicator that equals one if the government contract's length is greater than or equal to the median length, and zero otherwise.
GOV_Short	An indicator that equals one if the government contract's length is shorter than the median length, and zero otherwise.
GOV_First	An indicator that equals one if the earnings announcement date is within one year of the contract initiation, and zero otherwise.
GOV_NonFirst	An indicator that equals one if the earnings announcement date is within the second year and onwards of the government contract, and zero otherwise.
GOV_US	An indicator that equals one if the firm has a government contract that is from U.S. government, and zero otherwise.
GOV_NonUS	An indicator that equals one if the firm does not have a U.S.-government contract but has a contract from a non-U.S. government, and zero otherwise.
GOV_High_Stability	An indicator that equals one if *GOV* equals one and the government contract sources from a country with political stability higher than or equal to the median, and zero otherwise.
GOV_Low_Stability	An indicator that equals one if *GOV* equals one and the government contract sources from a country with political stability lower than the median, and zero otherwise.
GOV_High_Law	An indicator that equals one if *GOV* equals one and the government contract sources from a country with rule of law higher than or equal to the median, and zero otherwise.
GOV_Low_Law	An indicator that equals one if *GOV* equals one and the government contract sources from a country with rule of law lower than the median, and zero otherwise.
Std(ROA) 5 Years	The standard deviation of a firm's annual return-on-assets (*ROA*) during the five years subsequent to fiscal year *t*.
Std(ROA) 4 Years	The standard deviation of a firm's annual return-on-assets (*ROA*) during the four years subsequent to fiscal year *t*.
$ABS(DA_{original})$	The absolute value of discretionary accrual earnings estimated from the original Dechow and Dichev [20] model.
$ABS(DA_{modified})$	The absolute value of discretionary accrual earnings estimated from the modified Dechow and Dichev [20] model.
Bad Debt Percentage	The amount of a firm's allowance for doubtful receivables, scaled by its total account receivables in the current year.