The Real Effects of Accounting on R&D Alliance Formations and Innovation: Evidence from ASC 606

ABSTRACT

I examine how Accounting Standards Codification (ASC) 606 affects R&D alliance formations and innovation in the drug development industry. ASC 606 alters revenue recognition timing and increases disclosure requirements. I document that firms dependent on R&D alliance revenues accelerate revenue recognition and expand revenue-related disclosures following ASC 606 adoption. These concurrent changes reduce information asymmetry, both between firms and between managers and investors, but only when increased disclosure accompanies accelerated recognition. Consistent with these net reductions in information asymmetry, affected firms raise more equity capital and increase R&D investment. Notably, these firms, which historically acted as technology providers (principals), form more R&D alliances as technology acquirers (partners). Consequently, they exhibit higher innovation output, measured by new patents and drug candidates. This study identifies a specific mechanism through which accounting standards can stimulate innovation: reduced information asymmetry that facilitates strategic R&D alliance formation.

I. INTRODUCTION

A central question in accounting research is how accounting regulations affect managers' investment decisions. Despite its importance, evidence on the specific mechanisms through which accounting influences investment decisions and efficiency remains limited (see Kanodia and Sapra 2016; Leuz and Wysocki 2016; Roychowdhury, Shroff, and Verdi 2019). This study addresses this gap by examining how the new revenue recognition standard, ASC 606, affects R&D alliances and innovation—crucial investments and outcomes for which evidence is particularly scarce (Glaeser and Lang 2024). To identify the underlying mechanism, I focus on the drug development industry, an economically and socially significant setting characterized by prevalent R&D alliances and the availability of timely and precise innovation measures.

R&D alliances are a critical mode of investment for innovation, particularly in high-technology industries like drug development (e.g., Lerner and Rajan 2006; Robinson 2008). These alliances

typically involve a *principal* firm that provides intellectual property (IP) and a *partner* firm that pays for access to this technology to co-develop products. For instance, in the well-known BioNTech-Pfizer COVID-19 vaccine collaboration, BioNTech (principal) provides the mRNA technology, while Pfizer (partner) makes upfront, milestone, and royalty payments. Because technology transfers and payments span multiple reporting periods, principal firms face complex revenue recognition challenges. ASC 606 significantly affects these firms by fundamentally changing how alliance revenues are recognized.

Public firms were required to adopt ASC 606 for fiscal years beginning after December 15, 2017. This principles-based standard affects revenue recognition timing (primarily through the identification and satisfaction of performance obligations in contracts) while simultaneously mandating enhanced disclosures about the revenue recognition process and associated judgments (Deloitte 2017; KPMG 2018). Consequently, for principal firms in R&D alliances, ASC 606 generally leads to accelerated recognition of alliance revenues accompanied by increased disclosure about performance obligations and recognition timing.

These changes can affect R&D alliances and innovation outcomes by altering information asymmetry, both between managers and investors and among firms. In the drug development industry, information asymmetry between managers and investors is a primary friction hindering innovation investment, mainly through agency costs (e.g., Krieger, Li, and Papanikolaou 2021). Higher information asymmetry increases the cost of external capital, leading managers to underinvest in inherently risky innovative projects to avoid costly financing. Furthermore, information asymmetry between potential alliance participants creates significant friction in forming R&D partnerships (e.g., Lerner and Malmendier 2010). Specifically, this asymmetry increases search costs for suitable partners and complicates the contractual terms of alliances once potential partners are identified. Therefore, by potentially reducing these information asymmetries, ASC 606 could facilitate alliance formation and subsequent innovation.

However, the net effect of ASC 606 on the information content is ex ante ambiguous, as it depends on two offsetting effects on financial statement credibility (Dye, Glover, and Sunder 2014;

Gao and Jiang 2020). On one hand, the standard increases managerial discretion over revenue recognition timing compared to prior rules, potentially enabling managers to use this discretion opportunistically, thereby reducing financial statement credibility. On the other hand, ASC 606 mandates enhanced disclosures about interim performance obligations, associated judgments, and the timing of fulfillment, which could provide valuable information to investors and potential alliance partners. This combination of increased discretion and expanded disclosure may enable managers to credibly accelerate revenue recognition, particularly if the disclosures effectively support the timing choices. I empirically investigate whether the accelerated revenue recognition and accompanying disclosures under ASC 606 are jointly informative and alleviate information asymmetry. Specifically, I examine whether principal firms exhibit (a) lower information asymmetry, (b) greater access to capital, (c) increased R&D alliance formation, and (d) enhanced innovation outcomes following ASC 606 adoption.

I test these hypotheses using a sample of 7,538 firm-quarters from U.S. drug development firms from 2014 to 2019. The identification strategy leverages the fact that drug development firms generate two distinct revenue types: direct sales (from products and services) and alliance revenues (comprising upfront payments, milestones, and royalties). Crucially, while ASC 606 does not materially alter revenue recognition for direct sales, it substantially changes the accounting for alliance revenues—previously deferred revenues are now recognized as interim performance obligations are satisfied. I exploit this differential impact by using a firm's pre-adoption alliance revenue dependence (ARD) as a proxy for treatment intensity in a difference-in-differences (DiD) framework. ARD is measured as the firm's median ratio of alliance revenue to total revenue during the pre-adoption period (2014-2016), serving as a continuous treatment variable.[1] In this research design, potential endogeneity concerns would require that any correlated omitted variable not only varies with alliance revenue dependence but also exhibits differential effects across time. I mitigate this concern by thoroughly testing whether the parallel trends assumption is violated in the pre-ASC

1. Note that higher alliance revenue dependence implies that corresponding firms have a greater net tendency to enter R&D alliances as principals. That is, such firms provide the R&D technology and/or know-how that partners gain access to through alliance payments.

606 period.

Initially, I confirm that following ASC 606 adoption, firms with higher alliance revenue dependence (ARD firms) significantly increase revenue recognition disclosures and recognized revenues while decreasing deferred revenues, relative to firms less dependent on alliance revenue.[2] Consistent with these changes yielding a net reduction in information asymmetry between managers and investors, ARD firms exhibit lower bid-ask spreads and a lower probability of informed trading. Notably, this reduction occurs only when accelerated recognition is accompanied by increased disclosure, suggesting these two elements of ASC 606 are mutually reinforcing. Finally, corresponding with this decrease in information asymmetry, ARD firms show improved access to external capital, evidenced by significantly higher equity issuance post-adoption.

Turning to innovation-related real outcomes, ARD firms increase their R&D investments after ASC 606 adoption. Critically, consistent with reduced information asymmetry between firms, ARD firms become significantly more likely to enter R&D alliances as *partners*, acquiring technology. This marks a structural shift, as these firms historically acted as *principals*, providing technology to others. Consistent with collaborative R&D typically yielding more successful technology development outcomes (Danzon, Nicholson, and Pereira 2005), this increased R&D and alliance activity translates into improved innovation outcomes. ARD firms exhibit a significant increase in granted patents, higher patent values, and more drug candidates. The effects are economically meaningful; for instance, high-ARD firms produce 62.1 percent more drug candidates post-ASC 606 relative to the pre-period average. Further supporting the information-asymmetry channel, cross-sectional tests show these effects are stronger for firms with higher pre-existing information frictions, such as those that are less central in the prior alliance network (Kepler 2021) or that partner with private firms (Kim and Valentine 2023). Collectively, these findings suggest ASC 606 significantly reshapes R&D investment patterns and boosts innovation in the drug development industry by reducing information asymmetry both between managers and investors and

2. Since alliance revenue-dependence is a continuous treatment variable, there are no ARD or non-ARD firms. However, for ease of readability, I refer to firms with higher ARD as "ARD firms" hereafter.

among potential collaborating firms.[3]

Extensive robustness tests strengthen the causal inferences. First, addressing potential endogeneity from correlated omitted variables, dynamic DiD analyses support that the parallel trends assumption is not violated for key alliance and innovation outcomes prior to ASC 606 adoption; the estimated treatment effects are insignificant in the pre-period and become significant only after the standard's implementation. Second, I conduct a falsification test to address the concern that the increase in alliances reflects opportunism aimed at exploiting favorable revenue recognition rules rather than a strategic response to reduced information asymmetry. If the motive were purely opportunistic revenue management, ARD firms (historically principals) would be expected to increase their alliance activity as *principals* to generate more recognizable revenue post-ASC 606. However, I find no significant change in their activity as principals, while their activity as partners increases significantly, consistent with a strategic response to reduced information asymmetry rather than opportunism.

This study contributes to several streams of literature. First, it adds to research on the real effects of accounting (e.g., Leuz and Wysocki 2016; Roychowdhury, Shroff, and Verdi 2019), and, particularly, to the scarce evidence on how accounting regulation affects innovation (Glaeser and Lang 2024; Simpson and Tamayo 2020). Crucially, the study directly addresses calls for research examining the *specific* mechanisms through which accounting influences investment (see Roychowdhury, Shroff, and Verdi 2019) by demonstrating that ASC 606 enhances innovation through a clear channel: facilitating R&D alliances via reduced information asymmetry. This represents a novel contribution by identifying how accounting information fosters innovation through inter-firm collaborations—an understudied area (Glaeser and Lang 2024). While prior research examines the effects of accounting standards on aggregate R&D investment (e.g., Biddle, Hilary, and Verdi 2009; Shroff 2017) and innovation (e.g., Allen, Lewis-Western, and Valentine 2022; Breuer, Leuz, and Vanhaverbeke 2025; Williams and Williams 2021), these studies often focus on broad regulatory changes. With the exception of Williams and Williams (2021), previous work has generally not

3. These results raise the question of why firms couldn't achieve the same results via voluntary disclosures. I give two explanations based on proprietary costs and the credibility of disclosures in Section II.4.

linked specific financial reporting practices to targeted R&D investments and related outcomes.

Second, the paper contributes to the literature examining the intended and unintended consequences of ASC 606. As one of the most significant accounting standard changes in recent history, understanding its capital market and economic impacts is critical. This study extends emerging literature on ASC 606 (Ali and Tseng 2022; Chen et al. 2023; Glaze, Skinner, and Stephan 2024; Hinson, Pündrich, and Zakota 2024; Lee, Lee, and Sadka 2024) by providing novel evidence on the *real* effects of ASC 606, specifically on R&D investment, alliances, and innovation outcomes.

Third, the study informs the longstanding debate on principles-based versus rules-based accounting standards (e.g., Dye and Verrecchia 1995; Schipper 2003). By replacing disparate, rules-based guidance with a unified principles-based framework coupled with enhanced disclosures, ASC 606 provides a valuable setting to examine such transitions. Theory suggests that flexible, principles-based standards can be more informative (Gao and Jiang 2020), particularly when credible disclosures support the application of principles (Dye, Glover, and Sunder 2014; Dye and Sridhar 2008). Consistent with this, and aligning with concurrent work (Choi, Kim, and Wang 2022), my findings indicate that ASC 606 improves the information content of revenues for firms with complex revenue streams from R&D alliances. The results thus provide empirical support for the potential benefits of principles-based standards in reducing information asymmetry, particularly within a strong enforcement regime, such as that of the United States, where mandated disclosures lend credibility.

Finally, this research contributes to the innovation literature, particularly regarding the debate on the relative innovativeness of large versus small firms. While Akcigit and Kerr (2018) find small firms are more disruptive due to stronger incentives, Krieger, Li, and Papanikolaou (2021) find that smaller drug development firms produce less novel outputs because of financing constraints and risk. This study offers a potential reconciliation, highlighting information asymmetry related to complex revenue streams as a specific impediment for smaller drug development firms. The findings suggest that information asymmetry arising from alliance revenue recognition, common among smaller, ARD firms, can hinder their innovation. By alleviating information asymmetry

through accelerated recognition coupled with credible disclosure, ASC 606 facilitates increased R&D alliance investment and subsequent innovation among these typically smaller firms.

Two caveats warrant consideration. First, while the chosen setting enables powerful identification, the results' generalizability may be constrained by the well-known tradeoff between identification strength and external validity (Glaeser and Guay 2017). Responding to calls for research on specific mechanisms, this study utilizes the drug development industry because its prevalent R&D alliances and precise innovation metrics facilitate examining the proposed channels. Furthermore, ASC 606 serves as a useful shock as its primary intention was unrelated to influencing innovation. Although the identified mechanisms might extend to other high-technology sectors, caution is needed when extrapolating the findings to all industries or all accounting standards. Nonetheless, the drug development industry is economically significant in its own right, constituting a substantial portion (14 percent) of U.S. R&D expenditure and generating considerable social value (Filson and Oweis 2010; Murphy and Topel 2006), and ASC 606 itself represents a major accounting change worthy of study. Second, potential anticipation effects, where firms strategically alter behavior before ASC 606 adoption, could pose endogeneity concerns. This concern is mitigated by defining the treatment intensity variable (ARD) using median alliance revenue dependence from 2014-2016, a period ending well before mandatory adoption. This approach reduces the likelihood that the measure reflects strategic anticipation and allows the regulatory change to serve as a plausibly exogenous shock to the industry (Abbring and Van Den Berg 2003; Wooldridge 2021).

II. INSTITUTIONAL SETTINGS AND HYPOTHESIS DEVELOPMENT

Revenue Recognition and ASC 606

Revenue is a key metric for assessing firm performance and a highly persistent financial statement item (Schipper et al. 2009). Prior to 2014, however, U.S. GAAP lacked a comprehensive, unified standard for revenue recognition. Following extensive deliberations (Maines et al. 2003; Schipper et al. 2009), the Financial Accounting Standards Board (FASB) published an Accounting Standard Update in May 2014, later codified as Accounting Standards Codification (ASC) 606,

"Revenue from Contracts with Customers."[4] Public companies predominantly adopted ASC 606 for fiscal years beginning after December 15, 2017.

ASC 606 replaces disparate industry-specific rules with a single principles-based revenue recognition model applying a five-step framework across all firms (FASB 2016):

1. Identify contract(s) with customers
2. Identify the separate performance obligations in the contract
3. Determine the transaction price
4. Allocate the transaction price to separate performance obligations
5. Recognize revenue when (or as) each performance obligation is satisfied

A key change introduced by ASC 606 is the concept of distinct *performance obligations*. Management must disaggregate contracts into distinct performance obligations, requiring significant judgment. Crucially, ASC 606 also mandates disclosure of these performance obligations and the judgments involved in identifying them. Thus, the standard aims to enhance revenue information content by aligning recognition with performance obligations and requiring additional disclosures.

ASC 606 also significantly changes the treatment of *variable consideration* — amounts contingent on future events (e.g., milestones, royalties). Unlike prior standards where such amounts were typically deferred until known, ASC 606 requires entities to estimate variable consideration (using either an expected-value or most-likely-amount method) and include it in the transaction price at contract inception, provided there is no significant reversal risk. This estimation process inherently involves more judgment than under previous rules, but firms must disclose the methods used to estimate variable consideration and any constraints applied. Consequently, ASC 606 generally accelerates revenue recognition for variable consideration, albeit with increased judgment and accompanying disclosure requirements.

4. While replacement of the revenue recognition standard decision did not occur in a vacuum, the change was not immediately after an economic or political incident. Thus, there is less concern that my results are driven by incentives of policy makers (Watts and Zimmerman 1979) and correlated omitted variables around the standard change (Leuz and Wysocki 2016).

Drug Development Industry

A drug reaches the market following regulatory approvals (e.g., from the Food and Drug Administration (FDA) in the U.S. or the European Medicines Agency (EMA) in Europe) through a lengthy (typically 10-15 years) and costly (on average $2.56 billion) process (DiMasi, Grabowski, and Hansen 2016). The process generally begins with molecule discovery and initial development into a drug candidate. Firms typically apply for patents during early drug discovery since they cannot maintain secrecy when seeking regulatory approvals in subsequent stages. Unlike other high-technology industries, patenting occurs at the beginning of the innovation process rather than at completion. This provides researchers with precise and timely innovation measures based on patents and mitigates potential confounding events.[5]

Following discovery, drug candidates undergo preclinical testing and sequential clinical trials (Phases I, II, and III), each requiring regulatory approval. The long duration of this process, with infrequent and discrete milestones, creates significant information asymmetry between firm managers and external stakeholders. This elevated information asymmetry, combined with inherent development risks (e.g., only 20 percent of Phase I drug candidates receive approval), creates substantial financing and innovation challenges in the industry (Krieger, Li, and Papanikolaou 2021; Lo 2021; Thakor and Lo 2017). Consequently, collaboration through R&D alliances is prevalent and essential in the drug development industry, allowing firms to share risks, costs, and expertise (Robinson and Stuart 2007). Moreover, drugs developed via alliances often exhibit higher success rates (Danzon, Nicholson, and Pereira 2005).

Alliances not only influence innovation in drug development but also shape firm revenues. Drug development firms generate two distinct operating revenue types: direct sales and R&D-contract-driven alliance revenues, with varying proportions across firms. Alliance contracts typically include two payment categories: (a) upfront payments and (b) contingent future payments (milestone and royalty payments). A typical alliance involves two parties: the *principal* and the

5. Furthermore, patents provide good insights into the value of innovation for drug development firms. For instance, patent value at approval indicates drug candidates' net present value (Krieger, Li, and Papanikolaou 2021).

partner, who form an R&D alliance to co-develop a technology or drug. The principal provides certain technologies to the partner by granting access to intellectual property. In exchange, the partner pays an upfront fee and agrees to contingent future payments. These contingent payments comprise royalty payments (usually based on a percentage of drug sales revenue) and milestone payments (typically tied to sales volumes and/or drug candidate progress). Progress milestones can occur at any development phase, from preclinical trials to regulatory approval. For example, Exelixis received a $60 million milestone payment from Ipsen when their licensed drug Cabozantinib received EMA approval, and $7 million from Genentech when Cobimetinib completed Phase I clinical trials. Many drug development firms, particularly smaller specialty firms, rely heavily on these upfront and milestone payments from alliances to fund ongoing operations and R&D (Havenaar and Hiscocks 2012).

ASC 606 and Drug Development Industry

ASC 606 significantly impacts the drug development industry (see Figure 1 Panel A), primarily due to the prevalence of R&D alliances involving complex, multi-period revenue streams. The standard's effects are particularly pronounced for principal firms, which recognize revenue from these alliances. In contrast, the impact on partner firms making payments is relatively minor.[6]

ASC 606 fundamentally changes revenue recognition for principal firms from R&D alliances because technology deliveries and partner payments occur across multiple reporting periods. Specifically, ASC 606 requires firms to identify each contract's performance obligations and allocate prices accordingly. It enables principals to recognize payments as revenue upon completing interim performance obligations, earlier than allowed under previous standards.

This potential for earlier revenue recognition under ASC 606 applies to both upfront payments and certain milestone payments common in R&D alliances. First, whereas upfront payments were often recognized over time pre-ASC 606, the new standard typically requires recognizing upfront

6. Partner firms were impacted slightly by rules related to rebates and discounts. For example, under the legacy US GAAP, firms have to use the maximum discount available if it cannot reasonably estimate the discount. However, ASC 606 does not mandate the use of the maximum discount method.

fees as revenue when the associated performance obligation, such as the initial transfer of IP, is satisfied.[7] Second, revenue from milestones not based on sales or usage (e.g., regulatory milestones) may also be recognized earlier. This stems from the variable consideration guidance, which allows firms to estimate and recognize probable milestone payments before receipt, provided a significant revenue reversal is unlikely.[8] Previously, firms could not recognize contingent payments until received. Consequently, ASC 606 grants principal firms more judgment over the timing and amount of revenue recognized from alliance contracts. To address this increased discretion, ASC 606 requires enhanced disclosures explaining performance obligation determination, transaction price assessment, allocation of transaction prices to separate performance obligations, and satisfaction criteria for these obligations.[9]

Hypothesis Development

As discussed, ASC 606 introduces both increased managerial judgment and enhanced disclosure requirements regarding revenue recognition. This creates two opposing effects on financial reporting credibility and information content (Dye, Glover, and Sunder 2014; Dye and Verrecchia 1995; Gao and Jiang 2020). On one hand, when implemented objectively with well-defined interim performance obligations, ASC 606 should better align revenue recognition timing with underlying economic transactions. On the other hand, managers exercise significant control (and also possess more information) over the number and granularity of performance obligations, allocation of

7. As an example, Exelixis had recognized non-refundable upfront payments and milestone revenues over the life of the licensing contract prior to the adoption of ASC 606. The cumulative impact of the adoption in 2018 was $258 million, resulting in a net reduction of the accumulated deficit to $1.29 billion. Furthermore, after the adoption, the company's collaboration revenues increased from $103.45 million to $234.55 million between 2017 and 2018, largely due to the immediate recognition of upfront payments and a portion of milestones.

8. In the first quarter of 2018, after ASC 606 adoption, Exelixis recorded a $10 million contract asset for a probable milestone that would not be recognized prior to ASC 606, for example.

9. Aveo Pharmaceuticals, another drug development company, explains the disclosure requirements as follows in its 2017 Annual Report (Form 10-K, page 114), filed on March 13, 2018:

> "ASU 2014-09 requires more robust disclosures than required by previous guidance, including disclosures related to disaggregation of revenue into appropriate categories, performance obligations, the judgments made in revenue recognition determinations, adjustments to revenue which relate to activities from previous quarters or years, any significant reversals of revenue, and costs to obtain or fulfill contracts."

transaction prices across obligations, and the timing of obligation satisfaction. If financial statement users suspect opportunistic revenue recognition timing changes, credibility and information content decrease. However, ASC 606 addresses this concern by requiring enhanced disclosures articulating how interim performance obligations are determined and satisfied.

If accelerated revenue recognition combined with credible supporting disclosures jointly enhances information content, ASC 606 can increase financial statement informativeness and reduce information asymmetry both between firms and between managers and investors.[10] Focusing on information content and asymmetry between managers and investors, I expect ASC 606 adoption to enhance information content and lower information asymmetry (bid-ask spread and generalized probability of informed trading) for ARD firms. This expectation is based on ASC 606's significant effect on alliance revenues (with minimal impact on direct sales) and recent evidence on the decision usefulness of ASC 606 disaggregation (Hinson, Pündrich, and Zakota 2024).[11] Furthermore, I expect this result to hold only when disclosure accompanies accelerated recognition. Finally, due to decreased information asymmetry between managers and investors, I hypothesize that ASC 606 adoption facilitates greater capital access for ARD firms (Beyer et al. 2010; Lambert, Leuz, and Verrecchia 2007). Specifically, greater access to equity capital is expected rather than debt financing, as information asymmetry between debt holders and firms is not expected to change significantly due to existing private communication channels. This leads to the following hypotheses (stated in alternative form):

H1a: The adoption of ASC 606 reduces information asymmetry for ARD firms.

H1b: The effect in H1a is observed only when disclosure accompanies accelerated revenue recognition.

H2: The adoption of ASC 606 facilitates greater access to capital for ARD firms through equity

10. For instance, on November 14, 2017, Wedbush published an analyst report for NovoCure, a cancer treatment firm highly dependent on alliance revenues. The report argues that with the adoption of ASC 606, investors will better understand and appreciate the underlying business model and firm growth. Prior to ASC 606, there were no separate performance obligations, and the firm had to wait until cash was collected to record revenue, which made it difficult to understand the true demand for its technology.

11. Further, firms with more complex transactions like alliance revenues (i.e., ARD firms) can provide more information under the flexible accounting standard, ASC 606 (Dye and Sridhar 2008).

financing.

Even if ASC 606 enhances financial reporting informativeness for ARD firms (H1a, H1b), the impact on real innovation investments and outcomes remains ex-ante ambiguous. This ambiguity arises because managers may change their *real* actions and due to potential information spillover effects (Kanodia and Sapra 2016; Roychowdhury, Shroff, and Verdi 2019). On one hand, mandated disclosures revealing potentially proprietary information about alliance revenues could increase competitive pressures, possibly leading firms to decrease innovation investments (Beyer et al. 2010; Breuer, Leuz, and Vanhaverbeke 2025). On the other hand, by reducing uncertainty about ARD firms' technologies and project profitability, the enhanced transparency under ASC 606 could lower inter-firm information asymmetry, thereby facilitating cooperation and R&D alliance formation (Ferracuti and Stubben 2019; Roychowdhury, Shroff, and Verdi 2019). If the latter effect dominates, reduced inter-firm information asymmetry, combined with improved access to capital (H2), is expected to increase ARD firms' propensity to invest through R&D alliances, particularly on the *partner* side (acquiring technology).

H3a: Following ASC 606 adoption, ARD firms increase their formation of R&D alliances as partners.

Furthermore, the predicted increase in R&D alliance formation (H3a) is expected to lead to higher innovation for ARD firms, as alliances generally yield superior project performance compared to solo-firm projects due to risk and expertise sharing (Beshears 2013; Bodnaruk, Massa, and Simonov 2013; Cha et al. 2015; Danzon, Nicholson, and Pereira 2005). Therefore, the primary testable implication regarding innovation is stated in H4a.

H4a: Following ASC 606 adoption, ARD firms exhibit increased innovation outcomes.

Finally, to more directly test the proposed information asymmetry mechanism, I develop cross-sectional predictions for both alliance formation and innovation outcomes. The positive effect on alliance formations and innovation should be stronger in settings where inter-firm information asymmetry was likely higher before ASC 606. First, I expect concentrated effects for R&D alliances between ARD firms and private firms. Because private firms face greater resource con-

straints in acquiring information (Kim and Valentine 2023; Lerner and Merges 1998), information asymmetry is exacerbated between private and ARD firms. Thus, when private firms gain insights into ARD firms' project profitability after ASC 606, they become more willing to form R&D alliances with these firms. Second, I predict amplified effects for ARD firms that were less central in the pre-ASC 606 alliance network.[12] Since existing alliance participants already possess knowledge about innovations with principal firms (ARD firms) through private communication channels (Kepler 2021), information asymmetry for less central ARD firms was higher before ASC 606 compared to more central firms. Therefore, I expect the increase in R&D partner alliances and innovation outcomes to be concentrated among less central firms. These predictions are formalized in H3b and H4b.

H3b: The increase in partner R&D alliance formation (H3a) is more pronounced for ARD firms with higher pre-ASC 606 inter-firm information asymmetry.

H4b: The increase in innovation outcomes (H4a) is more pronounced for ARD firms with higher pre-ASC 606 inter-firm information asymmetry.

A natural question arises as to why firms could not achieve similar outcomes through voluntary disclosure prior to ASC 606. At least two factors likely impeded reliance on voluntary disclosure alone. First, mandatory disclosures, unlike voluntary ones, are subject to greater scrutiny from auditors and regulators (e.g., SEC oversight), enhancing their credibility and that of the associated recognized amounts (Davis-Friday et al. 1999; Roychowdhury and Srinivasan 2019). Second, voluntary disclosure of potentially proprietary information involves a trade-off between proprietary costs (spill-out) and potential learning benefits (spill-in) (Kim and Valentine 2021). In a voluntary disclosure regime, firms bear spill-out costs in all states but benefit from spill-ins only if other firms voluntarily make similar disclosures. Without mandated disclosure and enforcement, firms may reach a suboptimal equilibrium if higher net proprietary disclosure costs deter voluntary disclosure (Bhattacharya and Ritter 1983; Dye 1990; Verrecchia 1983).[13]

12. An alliance network for a given period consists of all sample firms and the connections between alliance participants. The centrality of a firm increases as other firms can reach the focal firms in fewer steps. Details about the network structure and centrality measures are explained in Section III.1.5

13. This resembles a prisoner's dilemma scenario. Furthermore, even an infinitely repeated prisoner's dilemma game

III. SAMPLE AND RESEARCH DESIGN

Data and Sample Selection

The initial sample comprises U.S. drug development firms identified using the Cortellis database, which provides detailed information on drug candidates and technologies. This process yields 510 firms with at least one active or completed drug development project since 2010. These firms are then merged with the Compustat database using company identifiers (names, websites, phone numbers). The sample period begins in 2014, following changes in Cortellis data definitions in 2013, and ends in 2019 to avoid potential confounding effects from the COVID-19 pandemic. Firms are required to have at least four quarters of Compustat data both before and after the ASC 606 adoption date, ensuring sufficient observation periods for the DiD analysis. Additionally, firms must have at least one quarter with positive revenue or deferred revenue prior to ASC 606 adoption to ensure the standard's potential relevance. Applying these screens results in 379 unique firms, which are subsequently merged with the CRSP database for market data. To ensure complete data availability for disclosure analysis, I require a successful merge with SEC EDGAR filings using the Central Index Key (CIK) identifier. This additional requirement results in the final sample consisting of 340 unique firms and 7,538 firm-quarter observations.

Revenue Recognition Disclosure

As hypothesized, ASC 606 is expected to affect financial reporting by accelerating revenue recognition (increasing revenues, decreasing deferred revenues) and mandating enhanced disclosures. To capture changes in disclosure quantity and content, I collected revenue recognition disclosures from quarterly and annual reports. Specifically, I use the Phi-4 instruct model to first find revenue recognition related pages and then, within these pages, to find relevant paragraphs. For each firm-quarter, these paragraphs constitute the disclosure sample. Disclosure quantity is measured using the total word count of these collected disclosures. Additionally, to capture se-

cannot yield a cooperative strategy if the disclosures from competing firms are not strongly complementary. That is, firms cannot innovate the same product without spill-in from others (Stein 2008).

mantic content changes, I employ an advanced textual analysis approach using Sentence-BERT (a variant of the Bidirectional Encoder Representations from Transformers architecture suitable for long texts) with the "all-mpnet-base-v2" model from the HuggingFace repository. This method generates 768-dimensional vector embeddings representing the semantic meaning of the revenue recognition disclosures, allowing for analysis of content changes beyond simple word counts. I quantified the semantic similarity of revenue recognition disclosures to concepts of 'Progress,' 'Innovation,' and 'R&D' using cosine similarity between the disclosure embeddings and Sentence-BERT embeddings of representative concept sentences.[14]

Information Asymmetry

Information asymmetry is measured using two common proxies: the bid-ask spread and the generalized probability of informed trading (GPIN). The bid-ask spread is calculated using daily closing bid and ask prices from CRSP; the daily spread (ask minus bid) is scaled by the midpoint price, and the quarterly median of these daily scaled spreads is used as the firm-quarter measure. GPIN is estimated following the methodology of Duarte, Hu, and Young (2020). Specifically, model parameters are estimated annually using NYSE-listed firms. These parameters are then used to compute the daily conditional probability of an information event (CPIE) for each sample firm based on daily buy/sell volume. The firm-quarter GPIN measure is the quarterly average of these daily CPIE values.

Alliance Data

Detailed alliance data are sourced from the Cortellis Deals Intelligence database, which compiles information from public disclosures of both public and private firms. This database extracts key deal characteristics including principal and partner identities, drug therapy area, development

14. Specifically, I compute cosine similarity between revenue recognition disclosure embeddings and the embeddings of three concept-specific sentences: (1) Progress: "This text discusses revenue recognized due to the firm's progress and achievement of milestones on its projects"; (2) R&D: "This text discusses revenue implications related to research and development activities of the firm"; and (3) Innovation: "This text discusses revenue generated from the firm's innovation and novel products or technologies." Higher similarity scores indicate greater semantic alignment between the disclosure content and these fundamental aspects of biopharmaceutical development.

stage, and payment structures (upfront, milestone, projected value). The initial dataset comprises 9,739 agreements initiated between 2014-2019 where at least one party (principal or partner) is a U.S. company. Given this study's focus on R&D investment and innovation, and recognizing the heterogeneity in deal types covered by Cortellis (e.g., collaborative R&D, supply-only licenses, and marketing), I restrict the sample to alliances explicitly identified as R&D-related, resulting in 3,984 R&D alliances for analysis. From these alliance records, I construct quarterly counts of new alliances initiated by firms. Specifically, 'R&D Partner Alliances' and 'R&D Principal Alliances' represent the number of new R&D-focused agreements where the firm acts as the partner or principal, respectively. Additionally, I construct 'Supply Only Alliances' from the broader dataset to serve as a comparison group for non-R&D focused contractual relationships.

Innovation Measures

Innovation activities and outcomes are proxied using widely accepted patent-based measures and drug candidate counts (Kogan et al. 2017; Krieger, Li, and Papanikolaou 2021; Lerner and Seru 2022). Patent data are primarily derived from an updated version of the Kogan et al. (2017) (KPSS) dataset. This dataset provides patent-level information, including forward citations received and an estimate of patent value based on the equity market reaction around the patent grant date. These data are aggregated to the firm-quarter level based on patent application dates to obtain measures of the number of patents granted, total forward citations received by those patents, and the total KPSS patent value (in 1982 USD). While raw citation counts are a common innovation proxy, they are mechanically correlated with patent age (newer patents have less time to accumulate citations). To address this issue, the study uses citations within five years (Lerner and Seru 2022), with citation data sourced from Google Patents and USPTO Patentsview. The KPSS patent value measure, reflecting the market's assessment of the innovation's net present value near the grant date, further mitigates this issue (Krieger, Li, and Papanikolaou 2021). In addition to patent-based metrics, I construct a firm-quarter measure of the number of drug candidates that the firm started in active development using data compiled from ClinicalTrials.gov, Cortellis, FactSet, and S&P Capital IQ.

Alliance Networks

To analyze the structure of inter-firm relationships and potential changes following ASC 606, quarterly R&D alliance networks are constructed for the period 2014-2019. In each quarter's network, nodes represent firms in the sample, and an undirected edge exists between two firms if they have participated in an R&D alliance together (as principal or partner) within the preceding five years, based on the alliance data described previously. Firm centrality within these networks is assessed using standard measures. *Closeness centrality* captures how close, on average, a firm is to all other reachable firms in the network. Following Freeman (1978), it is calculated for firm *i* as:

$$C(i) = \frac{n-1}{\sum_{j \neq i} d(i,j)} \tag{1}$$

where $C(i)$ is the closeness centrality of firm *i*, n is the number of nodes reachable from *i*, and $d(i,j)$ is the shortest path distance between firm *i* and firm *j*. Higher values indicate greater centrality. Additionally, *degree centrality* is used, measured as the number of direct connections (alliances) a firm has, scaled by the maximum possible connections ($N-1$, where N is the total number of firms in the network).

Descriptive Statistics

The main empirical analysis employs the continuous Alliance Revenue Dependence (ARD) measure, whose distribution is presented in Figure 1, Panel B. To illustrate key characteristics, I present descriptive statistics comparing firms above and below the median ARD ratio. Table 1 (Panel A, pre-ASC 606 period) indicates that Alliance Revenue Dependent (high-ARD) firms are typically younger and smaller (in terms of total assets and market capitalization) than Alliance Revenue Independent (low-ARD) firms. High-ARD firms also tend to have lower cash balances, revenues, and net income. Interestingly, despite their smaller size, high-ARD firms engage in a similar number of principal alliances (providing technology) as low-ARD firms. However, consistent with potentially higher information asymmetry hindering their ability to form partnerships,

high-ARD firms exhibit significantly fewer partnering alliances (acquiring technology) in the pre-period.

Research Design and Alliance Revenue Dependence

As outlined previously, the empirical identification strategy leverages the differential impact of ASC 606 on firms based on their pre-adoption reliance on alliance revenues versus direct sales revenues. Because ASC 606 primarily affects the recognition of alliance revenues, a firm's dependence on such revenues prior to the standard change serves as a proxy for treatment intensity.

Alliance revenues are collected from quarterly XBRL data via SEC EDGAR, using identified tag keywords related to alliance/collaboration revenue. The accuracy of this data extraction was verified through manual collection and comparison for a subsample of 170 firms. To construct the primary measure of treatment intensity, Alliance Revenue Dependence (ARD), quarterly alliance revenues are first divided by total quarterly revenues for each firm *i* and quarter *q*.

The firm-level treatment variable, ARD_i, is then defined as the median of these quarterly ratios over the pre-adoption period 2014-2016. Using the median minimizes the impact of outliers, and restricting the measurement period aims to mitigate concerns about strategic firm behavior in anticipation of ASC 606.

This continuous ARD_i measure serves as the primary treatment variable in the DiD analysis. Higher values of ARD_i indicate a greater reliance on alliance revenues pre-ASC 606, typically corresponding to firms acting as principals (technology providers, often smaller firms) in alliances. Robustness tests also employ an indicator variable based on whether ARD_i is above or below the sample median.

The effect of ASC 606 is estimated using a difference-in-differences (DiD) design with firm and time fixed effects. The general model specification is:

$$y_{i,t} = \beta(ARD_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{2}$$

where $y_{i,t}$ represents the outcome variable (e.g., information asymmetry, capital access, alliance formation, innovation measures) for firm *i* in quarter *t*. ARD_i is the continuous measure of pre-adoption alliance revenue dependence, and $ASC606_t$ is an indicator variable equal to one for quarters after the firm adopts ASC 606, and zero otherwise. $X_{i,t}$ is a vector of control variables specific to each model (detailed in Section IV). δ_i represents firm fixed effects, capturing time-invariant firm characteristics, and π_t represents year-quarter fixed effects, absorbing common time trends and shocks. The coefficient of interest is β, which captures the differential change in the outcome variable for firms with higher alliance revenue dependence after adopting ASC 606, relative to firms with lower dependence. For endogeneity to threaten the research design, any correlated omitted variable would need to not only vary with alliance revenue dependence but also exhibit differential effects across time.

IV. RESULTS AND DISCUSSION

ASC 606 Impact on Financial Statements

The drug development industry ranks as the second most materially affected by ASC 606 adoption (see Figure 1 Panel A). All sample firms adopted the standard using the modified retrospective method, recognizing the cumulative effect of applying the new rules to prior contracts as an adjustment to retained earnings upon adoption. Consistent with the expectation of a differential impact based on alliance revenue reliance, this cumulative adjustment averaged 1.4 percent of beginning total assets for Alliance Revenue Dependent (high-ARD) firms, compared to 0.8 percent for Alliance Revenue Independent (low-ARD) firms in the sample.

To confirm that ASC 606 disproportionately affects firms based on their pre-existing alliance revenue dependence, the following DiD model is estimated using *Revenue*, *Deferred Revenue*, and *Disclosure* as dependent variables ($y_{i,t}$) for firm *i* in quarter *t*:

$$y_{i,t} = \beta(ARD_i \times ASC606_t) + \delta_i + \pi_t + \epsilon_{i,t} \tag{3}$$

The model includes firm fixed effects (δ_i) and time fixed effects (π_t). The firm fixed effects absorb the time-invariant ARD_i main effect, while the time fixed effects absorb the main effect of the $ASC606_t$ adoption indicator. Thus, the coefficient of interest, β, isolates the differential effect of ASC 606 adoption for firms with higher ARD. Results, presented in Table 2, Panel A, confirm the expected differential impact. For firms with higher ARD, ASC 606 adoption is associated with a significant increase in recognized revenue (Column 1) and a significant decrease in deferred revenue (Column 2), consistent with accelerated revenue recognition. Furthermore, higher ARD firms exhibit a significant increase in the quantity of revenue-related disclosures (measured by word count, Column 3). The point estimate suggests a firm relying entirely on alliance revenue ($ARD = 1$) increases disclosure words by 29.9 percent relative to their pre-ASC 606 sample average (calculated as the coefficient of 382.040 from Table 2, Panel A, Column 3, divided by the pre-period mean of 1277.191 for high-ARD firms). Additionally, semantic analysis results (Table 2, Panel B) indicate that the content of ARD firms' disclosures becomes significantly more focused on progress, R&D, and innovation post-ASC 606.[15]

Information Asymmetry and Capital Access

Next, I test H1a, examining whether the reporting changes associated with ASC 606 lead to reduced manager-investor information asymmetry for ARD firms. The following DiD model is estimated using the natural logarithm of the bid-ask spread *Bid-Ask* and *GPIN* as dependent variables ($y_{i,t}$):

$$y_{i,t} = \beta(ARD_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{4}$$

where, following prior literature (Bogousslavsky, Fos, and Muravyev 2024; Coller and Yohn 1997; Nagar, Schoenfeld, and Wellman 2019), $X_{i,t}$ includes standard control variables known to influ-

15. Furthermore, the adoption of ASC 606 significantly decreased similarity between revenue recognition disclosures in subsequent filings for ARD firms, where similarity was measured using cosine distance between textual embeddings. The mean (median) similarity of pre-ASC 606 revenue recognition disclosures was 87.0 percent (87.7 percent), while for post-ASC 606 disclosures, it fell to 85.5 percent (86.0 percent). This 1.5 percentage point decrease (t-value 6.71) represents a 10.3 percent increase in disclosure uniqueness, calculated as 1 minus similarity, relative to the pre-ASC 606 sample mean uniqueness of 14.5 percent.

ence information asymmetry: firm size (*Size*), leverage (*Leverage*), analyst coverage (*Number of Analysts*), share turnover (*Turnover*), stock price (*Price*), trading volume (*Volume*), and return volatility (*Std Return*). The model also includes firm (δ_i) and year-quarter (π_t) fixed effects.

Results are presented in Table 3. Consistent with H1a, the coefficient on the interaction term ($ARD_i \times ASC606_t$) is significantly negative for both *Bid-Ask* (Column 1) and *GPIN* (Column 3). This indicates that firms with higher pre-adoption alliance revenue dependence exhibit a greater reduction in information asymmetry following ASC 606 adoption. The estimated effects are economically significant; for a firm relying solely on alliance revenue (ARD=1), the adoption of ASC 606 is associated with a 15.0 percent reduction in the bid-ask spread and a 6.9 percent reduction in the probability of informed trading (*GPIN*), relative to their respective pre-period averages.[16] These findings support the hypothesis that ASC 606 adoption, on net, reduced information asymmetry between managers and investors for more affected firms.

To test H1b—that the reduction in information asymmetry stems from the joint effect of accelerated recognition and increased disclosure—the analysis disentangles these two channels. Using the collected disclosure data, the following model is estimated:

$$\begin{aligned} y_{i,t} = \beta_1(ASC606Impact_i \times ASC606_t) + \beta_2(\Delta Disclosure_i \times ASC606_t) + \\ \beta_3(ASC606Impact_i \times \Delta Disclosure_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \end{aligned} \tag{5}$$

Here, $y_{i,t}$ is again *Bid-Ask* or *GPIN*, and $X_{i,t}$, δ_i, and π_t are as defined previously. $ASC606\ Impact_i$ proxies for the magnitude of the accounting change (acceleration), measured as the one-time cumulative effect of ASC 606 adoption on retained earnings, scaled by total assets at the adoption quarter, consistent with prior work (Shroff 2017).[17] $\Delta Disclosure_i$ represents the firm-specific change in disclosure quantity (mean post-ASC 606 disclosure minus mean pre-ASC 606

16. The magnitude for the bid-ask spread is calculated from the log-level model in Table 3, Column 1, as $(\exp(-0.163) - 1) \times 100\% = -15.0\%$. The magnitude for GPIN is calculated from the level-level model in Table 3, Column 3, by dividing the coefficient (-0.033) by the pre-ASC 606 mean of GPIN for the high-ARD group (0.478 from Table 1, Panel A), yielding -6.9%.

17. Firms evaluate their prior contracts under ASC 606. If there is any change in revenues or deferred revenues due to the satisfaction of performance obligations under ASC 606, firms reflect that in the accumulated earnings (or deficits) as a one time effect upon adoption.

disclosure).

The coefficient β_3 captures the joint effect of the accounting impact and the change in disclosure. As shown in Table 3 (Columns 2 and 4), β_3 is significantly negative for both information asymmetry proxies. This supports H1b, indicating that the reduction in information asymmetry is concentrated in firms experiencing *both* a larger accounting impact (acceleration) *and* a greater increase in disclosure. Notably, the coefficient β_1 (capturing the effect of the accounting impact without increased disclosure) is significantly positive, suggesting that accelerated recognition alone, without accompanying disclosure, may actually *increase* information asymmetry. These results underscore the mutually reinforcing roles of recognition changes and disclosure under ASC 606 in enhancing market information.[18]

Hypothesis H2 predicts that the reduction in information asymmetry facilitates greater access to capital for ARD firms. This is tested using measures of external financing activity as the dependent variable ($CapitalAccess_{i,t}$). Specifically, using *New Equity Issuance* and *New Debt Issuance* measures from (i) balance sheet data and (ii) SDC Platinum database as dependent variables, the following DiD model is estimated:

$$CapitalAccess_{i,t} = \beta(ARD_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{6}$$

where, following prior literature (Brav 2009; Goldstein, Yang, and Zuo 2023; Hovakimian, Hovakimian, and Tehranian 2004; Morck et al. 1990), control variables ($X_{i,t}$) include factors known to influence financing decisions, such as profitability (*ROA*), asset tangibility (*TangibleAssets*), firm size (*Size*), asset growth (*Growth*), cash flow from operations (*CFO*), CFO growth (*CFO Growth*), sales growth (*Sales Growth*), stock price (*Price*), and stock return (*Return*). Firm (δ_i) and year-quarter (π_t) fixed effects are included.

Table 4 presents the results. Consistent with H2, the coefficient β is significantly positive in

18. Consistent with proprietary cost deterring voluntary disclosure, especially in high technological competition fields (Glaeser and Landsman 2021), in untabulated results I find that the increase in revenue recognition disclosures post-ASC 606 is more pronounced for the firms in high technological competition fields before ASC 606 (i.e., firms within a dense drug development technology cluster in terms of the number of firms sharing the same drug development technology).

regressions using equity issuance as the dependent variable, both for the balance sheet measure (Column 1) and the SDC measure (Column 3). This indicates that ARD firms significantly increased their equity issuance following ASC 606 adoption. The effect is economically meaningful; for instance, based on the balance sheet measure, the estimates imply that a firm relying solely on alliance revenues increases equity issuance by 19.6 percent relative to the pre-ASC 606 sample average for high-ARD firms.[19] In contrast, the coefficient β is insignificant in regressions using debt issuance as the dependent variable (Columns 2 and 4), suggesting ASC 606 adoption did not differentially affect debt financing for ARD firms.

The differential impact on equity versus debt financing likely reflects distinct information environments between public equity markets and debt markets. Banks and other primary debt providers often possess significant private information through established lending relationships (e.g., Plumlee et al. 2015), potentially making the enhanced public disclosures under ASC 606 less incrementally informative for their credit decisions. Equity investors, conversely, rely more heavily on public disclosures and thus may benefit more from the increased transparency provided by ASC 606, leading to easier equity financing. This pattern suggests that the standard's effects on capital access are more pronounced for arm's-length financing via public equity markets.

Collectively, strong evidence indicates that ASC 606 adoption is associated with reduced manager-investor information asymmetry for ARD firms, particularly when accelerated recognition is paired with enhanced disclosure, and that this reduction translates into improved access to equity capital.

R&D Investment and Alliances

Given the evidence of improved access to equity capital (H2), I next examine whether ARD firms increase their R&D investments post-ASC 606, as might be expected if financing constraints are relaxed (Krieger, Li, and Papanikolaou 2021). The following DiD model is estimated using

19. This economic magnitude is calculated from the level-level model in Table 4, Column 1, by dividing the coefficient on $ARD \times ASC606$ (0.018) by the pre-ASC 606 sample mean of "New Equity Issuance (BS)" for the high-ARD group (0.092 from Table 1, Panel A).

R&D intensity (*R&D*, measured as R&D expense scaled by assets) as the dependent variable:

$$R\&D_{i,t} = \beta(ARD_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{7}$$

where, following prior literature (Biddle, Hilary, and Verdi 2009; Fazzari et al. 1988; Shroff 2017), control variables ($X_{i,t}$) include lagged return on assets (*ROA*), lagged market value of equity (*MVE*), cash flow from operations (*CFO*), lagged Tobin's Q (*TobinsQ*), lagged cash holdings (*Cash*), and lagged asset growth (*Growth*), factors known to influence corporate investment. Firm (δ_i) and year-quarter (π_t) fixed effects are included.

Results in Table 5 (Column 1) show a significantly positive coefficient β, indicating that ARD firms significantly increase their R&D intensity after ASC 606 adoption. The estimated magnitude suggests that a firm relying solely on alliance revenues increases its R&D intensity by 15.8 percent relative to the pre-ASC 606 sample average, an economically meaningful effect.[20]

To further understand changing R&D investment patterns, I investigate whether ASC 606 alters the structure of R&D activities, specifically alliance formation, testing H3a. Consistent with the hypothesis that reduced inter-firm information asymmetry facilitates collaboration, the standard DiD model is re-estimated using the quarterly count of new R&D alliances where the sample firm acts as the *partner* (*R&D Partner Alliances*) as the dependent variable. The model includes the same set of control variables used in the R&D intensity regression, as factors influencing overall investment also relate to alliance formation decisions (Kepler 2021; Robinson 2008; Robinson and Stuart 2007).

The OLS results presented in Table 5 (Column 2) support H3a. The coefficient β on the interaction term is positive and significant, indicating that ARD firms form significantly more R&D alliances as partners after ASC 606 adoption. The effect is economically substantial: a firm relying solely on alliance revenues increases its formation of partner alliances by 52.4 percent relative

20. This economic magnitude is calculated from the level-level model in Table 5, Column 1, by dividing the coefficient on $ARD \times ASC606$ (0.019) by the pre-ASC 606 sample mean of R&D Intensity for the high-ARD group (0.120 from Table 1, Panel A).

to the pre-ASC 606 sample average.[21] This finding is consistent with ASC 606 reducing inter-firm information asymmetry and enabling greater collaboration, particularly allowing historically principal firms (high-ARD) to engage more in accessing external technology as partners.

Given that the dependent variable (number of alliances) is a non-negative integer count, OLS estimation may be inappropriate (Rock, Sedo, and Willenborg 2000). Therefore, the model is also estimated using a negative binomial regression, a standard approach for count data that, unlike Poisson models, relaxes the equidispersion assumption. Due to concerns about the incidental parameters problem when including numerous fixed effects in non-linear models, the negative binomial specification omits firm fixed effects but retains year-quarter fixed effects and includes time-varying firm-level controls. The results from the negative binomial estimation (Table 5, Column 3) corroborate the OLS findings, showing a significant positive coefficient on the interaction term $ARD_i \times ASC606_t$, further supporting H3a.

Innovation Outcomes

Next, I investigate the ultimate impact on innovation outcomes, testing H4a. Building on the findings of increased R&D investment and alliance formation, this hypothesis predicts that ASC 606 adoption leads to greater innovation output for ARD firms. The standard DiD model is estimated using various innovation proxies as the dependent variable ($Innovation_{i,t}$):

$$Innovation_{i,t} = \beta(ARD_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{8}$$

where, the innovation measures include the quarterly log number of patents granted (*Number of Patents*), log total forward citations (*Forward Citations*), log total KPSS patent value (*Patent Value*), and the number of drug candidates (*Number of Drug Candidates*). Following prior literature (Allen, Lewis-Western, and Valentine 2022; Kim and Valentine 2021), control variables ($X_{i,t}$) include factors known to influence innovation, such as lagged profitability (*ROA*), lagged

21. This magnitude is calculated from the OLS model in Table 5, Column 2, by dividing the coefficient (0.075) by the pre-ASC 606 mean of R&D Partner Alliances for the high-ARD group (0.146 from Table 1, Panel A).

firm size (*Size*), and the Hadlock-Pierce index of financial constraints (*HP Index*). Firm (δ_i) and year-quarter (π_t) fixed effects are included.

Results in Table 6 provide strong support for H4a. The coefficient β on the interaction term is significantly positive across all four innovation measures. This indicates that, following ASC 606 adoption, ARD firms experience significantly greater increases in patent counts, patent citations, patent value, and the number of drug candidates compared to less ARD firms. The economic magnitudes are substantial: for firms relying solely on alliance revenue, point estimates suggest post-adoption increases of 17.0 percent in patent counts, 28.1 percent in forward citations, 23.5 percent in patent value, and a 62.1 percent increase in the number of drug candidates.[22] These magnitudes are consistent with findings in related literature on the real effects of disclosure. For instance, Kim and Valentine (2021), who study the effects of a patent disclosure rule change, find that treated firm groups experience changes in forward citations in the 15-33 percent range depending on the specification and treated group.

Robustness Tests

The validity of the DiD estimates relies on the parallel trends assumption—that trends in outcomes for high- and low-ARD firms would have remained parallel absent ASC 606. This assumption is assessed graphically using dynamic DiD models that estimate event-time coefficients (β_t) for quarters surrounding the adoption date. Figure 2, Panel A presents evidence for partner R&D alliances, while Figure 3, Panel A (Number of Patents) and Figure 3, Panel B (Patent Values) show results for innovation outcomes. Consistent with the parallel trends assumption, all figures show no statistically significant differences in trends between high- and low-ARD firms in the quarters leading up to ASC 606 adoption (i.e., the pre-period coefficients are insignificant). In contrast, significant positive effects emerge and persist in the post-adoption period for both partner alliances and innovation measures. This pattern supports the parallel trends assumption and strengthens con-

22. The magnitudes for *Number of Patents*, *Forward Citations*, and *Patent Value* are calculated from their respective log-level models (Table 6, Columns 1-3) as $(\exp(\beta) - 1) \times 100\%$, using the coefficients 0.157, 0.248, and 0.211. The magnitude for Number of Drug Candidates, which is a level-level model (Column 4), is calculated by dividing its coefficient (0.118) by the pre-ASC 606 mean for the high-ARD group (0.190 from Table 1, Panel A).

fidence that the estimated effects capture the impact of ASC 606 rather than pre-existing differential trends.

Additional tests bolster the main findings. One potential concern is whether the observed increase in R&D partner alliances reflects genuine changes in investment behavior or merely shifts in contractual labeling without substantive change. Prior research suggests alliance contract provisions can change in response to accounting quality (Ge, Ji, and Louis 2020). If ASC 606 simply led firms to restructure or relabel existing activities as new *partner* alliances, the documented increase might not represent a true increase in R&D alliance investment.

To address this concern, two placebo-style tests examine alliance types less likely to be affected by the hypothesized mechanism or potentially indicative of opportunistic relabeling. For each test, I present results using both Negative Binomial regression (appropriate for count data) and OLS estimation (for consistency with earlier specifications), with the Negative Binomial models omitting firm fixed effects due to incidental parameters concerns. First, the analysis examines *supply-only* partner alliances, which focus on production rather than joint R&D and are typically less complex, requiring less information as they are substantially less risky. If the main results were driven by general shifts in contracting rather than reduced R&D information asymmetry, one might expect similar increases in these alliances. However, results in Table 7 (Column 1 and 2) show no significant differential change in supply partner alliances for ARD firms post-ASC 606. Second, the analysis examines changes in *R&D principal* alliances. If the increase in partner alliances reflected opportunistic relabeling or efforts solely to manage revenue recognition (as principals record the revenue), ARD firms might also increase their activity as principals. Yet, Table 7 (Column 3 and 4) reveals no significant change in the propensity of ARD firms to enter alliances as principals. Figure 2, Panel B provides additional support, showing no significant differential trend for principal alliances either before or after adoption, aligning with these null results. These findings suggest the documented increase in partner R&D alliances is unlikely driven solely by contractual relabeling or opportunistic revenue management, lending further support to a substantive change in investment behavior.

Finally, I consider potential confounding effects from tax considerations. While ASC 606 primarily addresses financial reporting, accelerated revenue recognition could potentially increase taxable income and cash tax outflows for some firms, biasing *against* finding increased investment. Furthermore, the concurrent enactment of the Tax Cuts and Jobs Act of 2017 is unlikely to drive the results, as ARD firms are often loss-making and potentially negatively impacted by TCJA provisions (e.g., limitations on NOL carryforwards). Consistent with minimal tax channel effects, untabulated analyses reveal no significant differential changes in estimated effective tax rates or deferred tax balances for ARD firms around ASC 606 adoption.

Cross-Sectional Tests

Further cross-sectional tests are performed to strengthen inferences about the role of inter-firm information asymmetry (H3b and H4b). These tests examine whether the increase in partner R&D alliances for ARD firms is more pronounced in settings where pre-ASC 606 information asymmetry between potential partners is expected to be higher. First, the analysis distinguishes between alliances where the ARD firm partners with a private versus a public principal. Information asymmetry is likely higher when dealing with private firms due to their limited public disclosures and potential resource constraints in information acquisition (Kim and Valentine 2023). Consistent with H3b, the standard DiD model estimated separately for these subsamples (Table 8) shows a significant positive effect on R&D partner alliance formation for both private (Column 1) and public (Column 2) principals. However, the effect is significantly stronger when the principal firm is private, as evidenced by the significant positive difference between the two coefficients (Column 3).

Second, leveraging the alliance network structure, I test whether the effect is stronger for ARD firms that were less central prior to ASC 606. Firms central in existing alliance networks may have access to private information channels, reducing pre-existing information asymmetry (Kepler 2021). Therefore, less central firms are expected to benefit more from the enhanced public informa-

tion under ASC 606. This prediction is tested using the following triple interaction specification:

$$y_{i,t} = \beta_1 LowCentrality_i + \beta_2(ARD_i \times ASC606_t) + \\ \beta_3(ARD_i \times LowCentrality_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{9}$$

where $y_{i,t}$ represents either alliance formation or innovation measures, $LowCentrality_i$ is an indicator for below-median pre-ASC 606 degree centrality, and other variables are as previously defined.

As shown in Table 9, the coefficient β_3 on the triple interaction term is significantly positive using both Negative Binomial (Column 1) and OLS (Column 2) estimation. This result indicates that the increase in partner R&D alliances following ASC 606 adoption was significantly greater for high-ARD firms that were less central (i.e., faced higher pre-existing inter-firm information asymmetry). Both cross-sectional tests thus provide corroborating evidence consistent with ASC 606 facilitating alliances by reducing information barriers between firms.

Similarly, Table 10 presents the results using innovation measures as dependent variables. Consistent with H4b, the coefficient β_3 on the triple interaction term is significantly positive for all of the innovation measures. This indicates that the positive innovation effects of ASC 606 are indeed more pronounced for ARD firms that were less connected (and thus likely faced higher inter-firm information barriers) prior to the standard's adoption, supporting the hypothesized mechanism.

Network Analysis

Understanding shifts in industry structure, such as the reallocation of resources or changes in transactional relationships, carries policy implications (Breuer 2021). The finding that ARD firms (often smaller, historically principal firms) increase their partnering activity suggests a potential shift in the overall structure of the R&D alliance network. To investigate this possibility, the analysis examines whether ASC 606 adoption led to changes in the network centrality of ARD firms

using the following firm-year level DiD model:

$$Centrality_{i,t} = \beta(ARD_i \times ASC606_t) + \gamma' X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t} \tag{10}$$

where $Centrality_{i,t}$ is either *Closeness Centrality* or *Degree Centrality* for firm *i* in year *t*, calculated based on the alliance network described previously. $X_{i,t}$ includes the standard investment controls, δ_i represents firm fixed effects, and π_t represents year fixed effects.

Results in Table 11 show that the coefficient β is significantly positive for both closeness and degree centrality measures. This indicates that ARD firms became significantly more central within the R&D alliance network following ASC 606 adoption. The economic significance is notable. Based on the full specifications that include control variables (Columns 2 and 4), point estimates imply that firms relying solely on alliance revenues experienced a 0.8 percent increase in closeness centrality and a 3.3 percent increase in degree centrality.[23] This suggests ASC 606 contributed to a measurable restructuring of the industry's collaborative network, integrating historically principal-focused firms more centrally through increased partnering activity.

V. CONCLUSION

This study examines the real effects of the new revenue recognition standard, ASC 606, focusing on R&D alliances and innovation within the U.S. drug development industry, an economically and socially vital sector. The findings indicate that firms highly dependent on alliance revenues (ARD firms) experience significant changes following adoption: they accelerate revenue recognition, reduce deferred revenues, and increase related disclosures. Consistent with these changes jointly enhancing information content, ARD firms exhibit reduced information asymmetry, improved access to equity financing, and increased R&D investment. Notably, ARD firms—historically technology providers—significantly increase their participation as technology acquirers in

23. These magnitudes are calculated from the log-level models in the full specifications presented in Table 11. The increase in closeness centrality is calculated from the model in Column 2 as $(\exp(0.008) - 1) \times 100\% = 0.8\%$. The increase in degree centrality is calculated from the model in Column 4 as $(\exp(0.032) - 1) \times 100\% = 3.3\%$.

R&D alliances, contributing to industry network restructuring. These changes ultimately culminate in improved innovation outcomes, evidenced by increases in patents and drug candidates.

These findings contribute to multiple literature streams. First, the study adds to the literature on real effects of accounting by identifying R&D alliance formation as the *specific* mechanism through which ASC 606 influences innovation outcomes, directly addressing calls for research examining how—rather than whether—accounting affects innovation. Second, the study provides some of the first evidence of ASC 606's real effects, complementing existing work on this landmark standard's financial reporting consequences. Third, the results offer empirical support for theoretical predictions about principles-based standards coupled with enhanced disclosure, informing the ongoing debate about optimal accounting standard design. Finally, the study contributes to the innovation literature by demonstrating how information frictions tied to complex revenue recognition can constrain the innovation capacity of smaller, alliance revenue-dependent firms.

REFERENCES

Abbring, J. H., and G. J. Van Den Berg. 2003. The Nonparametric Identification of Treatment Effects in Duration Models. *Econometrica* 71 (5): 1491–1517. https://doi.org/10.1111/1468-0262.00456.

Akcigit, U., and W. R. Kerr. 2018. Growth through Heterogeneous Innovations. *Journal of Political Economy* 126 (4): 1374–1443. https://doi.org/10.1086/697901.

Ali, W., and A. Tseng. 2022. The Effects of ASC 606 on Revenue Recognition. *Working paper,* https://doi.org/10.2139/ssrn.4084006.

Allen, A., M. F. Lewis-Western, and K. Valentine. 2022. The Innovation and Reporting Consequences of Financial Regulation for Young Life-Cycle Firms. *Journal of Accounting Research* 60 (1): 45–95. https://doi.org/10.1111/1475-679X.12398.

Beshears, J. 2013. The Performance of Corporate Alliances: Evidence from Oil and Gas Drilling in the Gulf of Mexico. *Journal of Financial Economics* 110 (2): 324–346. https://doi.org/10.1016/j.jfineco.2013.07.005.

Beyer, A., D. A. Cohen, T. Z. Lys, and B. R. Walther. 2010. The Financial Reporting Environment: Review of the Recent Literature. *Journal of Accounting and Economics* 50 (2): 296–343. https://doi.org/10.1016/j.jacceco.2010.10.003.

Bhattacharya, S., and J. R. Ritter. 1983. Innovation and Communication: Signalling with Partial Disclosure. *The Review of Economic Studies* 50 (2): 331–346. https://doi.org/10.2307/2297419.

Biddle, G. C., G. Hilary, and R. S. Verdi. 2009. How Does Financial Reporting Quality Relate to Investment Efficiency? *Journal of Accounting and Economics* 48 (2): 112–131. https://doi.org/10.1016/j.jacceco.2009.09.001.

Bodnaruk, A., M. Massa, and A. Simonov. 2013. Alliances and Corporate Governance. *Journal of Financial Economics* 107 (3): 671–693. https://doi.org/10.1016/j.jfineco.2012.09.010.

Bogousslavsky, V., V. Fos, and D. Muravyev. 2024. Informed Trading Intensity. *The Journal of Finance* 79 (2): 903–948. https://doi.org/10.1111/jofi.13320.

Brav, O. 2009. Access to Capital, Capital Structure, and the Funding of the Firm. *The Journal of Finance* 64 (1): 263–308. https://doi.org/10.1111/j.1540-6261.2008.01434.x.

Breuer, M. 2021. How Does Financial-Reporting Regulation Affect Industry-Wide Resource Allocation? *Journal of Accounting Research* 59 (1): 59–110. https://doi.org/10.1111/1475-679X.12345.

Breuer, M., C. Leuz, and S. Vanhaverbeke. 2025. Reporting Regulation and Corporate Innovation. *Journal of Accounting and Economics,* 101769. https://doi.org/10.1016/j.jacceco.2025.101769.

Cha, M., A. Saxena, K. Smietana, and R. Bansal. 2015. Panning for Gold: Sourcing Pharmaceutical Innovation. *Nature Reviews Drug Discovery* 14, no. 6 (6): 376–376. https://doi.org/10.1038/nrd4647.

Chen, Y., M. D. Kimbrough, K. Lee, and S. Lee. 2023. The Effect of ASC 606 on Management Forecasts: A Lesson for Principles-based Accounting Standard. *Working paper,* https://doi.org/10.2139/ssrn.4584844.

Choi, D., S. Kim, and X. Wang. 2022. Heterogeneity in the Financial-Reporting Effects of ASC 606 Adoptions: Evidence from an Industry-Focused Approach. *Working paper,* https://doi.org/10.2139/ssrn.4111345.

Coller, M., and T. L. Yohn. 1997. Management Forecasts and Information Asymmetry: An Examination of Bid-Ask Spreads. *Journal of Accounting Research* 35 (2): 181–191. https://doi.org/10.2307/2491359.

Danzon, P. M., S. Nicholson, and N. S. Pereira. 2005. Productivity in Pharmaceutical–Biotechnology R&D: The Role of Experience and Alliances. *Journal of Health Economics* 24 (2): 317–339. https://doi.org/10.1016/j.jhealeco.2004.09.006.

Davis-Friday, P. Y., L. B. Folami, C.-S. Liu, and H. F. Mittelstaedt. 1999. The Value Relevance of Financial Statement Recognition vs. Disclosure: Evidence from SFAS No. 106. *The Accounting Review* 74 (4): 403–423. https://doi.org/10.2308/accr.1999.74.4.403.

Deloitte. 2017. *Accounting and Financial Reporting Update — Interpretive Guidance on Revenue Recognition Under ASC 606.* (available at link).

DiMasi, J. A., H. G. Grabowski, and R. W. Hansen. 2016. Innovation in the Pharmaceutical Industry: New Estimates of R&D Costs. *Journal of Health Economics* 47:20–33. https://doi.org/10.1016/j.jhealeco.2016.01.012.

Duarte, J., E. Hu, and L. Young. 2020. A Comparison of Some Structural Models of Private Information Arrival. *Journal of Financial Economics* 135 (3): 795–815. https://doi.org/10.1016/j.jfineco.2019.08.005.

Dye, R. A. 1990. Mandatory versus Voluntary Disclosures: The Cases of Financial and Real Externalities. *The Accounting Review* 65 (1): 1–24.

Dye, R. A., J. C. Glover, and S. Sunder. 2014. Financial Engineering and the Arms Race Between Accounting Standard Setters and Preparers. *Accounting Horizons* 29 (2): 265–295. https://doi.org/10.2308/acch-50992.

Dye, R. A., and S. S. Sridhar. 2008. A Positive Theory of Flexibility in Accounting Standards. *Journal of Accounting and Economics* 46 (2): 312–333. https://doi.org/10.1016/j.jacceco.2008.09.002.

Dye, R. A., and R. E. Verrecchia. 1995. Discretion vs. Uniformity: Choices among GAAP. *The Accounting Review* 70 (3): 389–415.

FASB. 2016. *Revenue from Contracts with Customers (Topic 606).* Accounting Standards Update ASU 2016-10. (available at link).

Fazzari, S. M., R. G. Hubbard, B. C. Petersen, A. S. Blinder, and J. M. Poterba. 1988. Financing Constraints and Corporate Investment. *Brookings Papers on Economic Activity* 1988 (1): 141–206. https://doi.org/10.2307/2534426.

Ferracuti, E., and S. R. Stubben. 2019. The Role of Financial Reporting in Resolving Uncertainty About Corporate Investment Opportunities. *Journal of Accounting and Economics* 68 (2): 101248. https://doi.org/10.1016/j.jacceco.2019.101248.

Filson, D., and A. Oweis. 2010. The Impacts of the Rise of Paragraph IV Challenges on Startup Alliance Formation and Firm Value in the Pharmaceutical Industry. *Journal of Health Economics* 29 (4): 575–584. https://doi.org/10.1016/j.jhealeco.2010.05.002.

Freeman, L. C. 1978. Centrality in Social Networks Conceptual Clarification. *Social Networks* 1 (3): 215–239. https://doi.org/10.1016/0378-8733(78)90021-7.

Gao, P., and X. Jiang. 2020. The Economic Consequences of Discrete Recognition and Continuous Measurement. *Journal of Accounting and Economics* 69 (1): 101250. https://doi.org/10.1016/j.jacceco.2019.101250.

Ge, R., Y. Ji, and H. Louis. 2020. Accounting Quality and Alliance Contract Provisions. *The Accounting Review* 96 (4): 261–287. https://doi.org/10.2308/TAR-2017-0623.

Glaeser, S. A., and W. R. Guay. 2017. Identification and Generalizability in Accounting Research: A Discussion of Christensen, Floyd, Liu, and Maffett (2017). *Journal of Accounting and Economics* 64 (2): 305–312. https://doi.org/10.1016/j.jacceco.2017.08.003.

Glaeser, S. A., and W. R. Landsman. 2021. Deterrent Disclosure. *The Accounting Review* 96 (5): 291–315. https://doi.org/10.2308/TAR-2019-1050.

Glaeser, S. A., and M. Lang. 2024. Measuring Innovation and Navigating Its Unique Information Issues: A Review of the Accounting Literature on Innovation. *Journal of Accounting and Economics,* 101720. https://doi.org/10.1016/j.jacceco.2024.101720.

Glaze, J. L., A. N. Skinner, and A. Stephan. 2024. When Are Concurrent Quarterly Reports Useful for Investors? Evidence from ASC 606. *Review of Accounting Studies* 29 (2): 1360–1406. https://doi.org/10.1007/s11142-022-09744-7.

Goldstein, I., S. Yang, and L. Zuo. 2023. The Real Effects of Modern Information Technologies: Evidence from the EDGAR Implementation. *Journal of Accounting Research* 61 (5): 1699–1733. https://doi.org/10.1111/1475-679X.12496.

Hadlock, C. J., and J. R. Pierce. 2010. New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. *The Review of Financial Studies* 23 (5): 1909–1940. https://doi.org/10.1093/rfs/hhq009.

Havenaar, M., and P. Hiscocks. 2012. Strategic Alliances and Market Risk. *Drug Discovery Today* 17 (15): 824–827. https://doi.org/10.1016/j.drudis.2012.03.008.

Hinson, L. A., G. P. Pündrich, and M. Zakota. 2024. The Decision-Usefulness of ASC 606 Revenue Disaggregation. *The Accounting Review* 99 (3): 225–258. https://doi.org/10.2308/TAR-2022-0078.

Hovakimian, A., G. Hovakimian, and H. Tehranian. 2004. Determinants of Target Capital Structure: The Case of Dual Debt and Equity Issues. *Journal of Financial Economics* 71 (3): 517–540. https://doi.org/10.1016/S0304-405X(03)00181-8.

Kanodia, C., and H. Sapra. 2016. A Real Effects Perspective to Accounting Measurement and Disclosure: Implications and Insights for Future Research. *Journal of Accounting Research* 54 (2): 623–676. https://doi.org/10.1111/1475-679X.12109.

Kepler, J. D. 2021. Private Communication Among Competitors and Public Disclosure. *Journal of Accounting and Economics* 71 (2): 101387. https://doi.org/10.1016/j.jacceco.2021.101387.

Kim, J., and K. Valentine. 2021. The Innovation Consequences of Mandatory Patent Disclosures. *Journal of Accounting and Economics* 71 (2): 101381. https://doi.org/10.1016/j.jacceco.2020.101381.

Kim, J., and K. Valentine. 2023. Public Firm Disclosures and the Market for Innovation. *Journal of Accounting and Economics* 76 (1): 101577. https://doi.org/10.1016/j.jacceco.2023.101577.

Kogan, L., D. Papanikolaou, A. Seru, and N. Stoffman. 2017. Technological Innovation, Resource Allocation, and Growth. *The Quarterly Journal of Economics* 132 (2): 665–712. https://doi.org/10.1093/qje/qjw040.

KPMG. 2018. *Revenue Recognition Handbook.* (available at link).

Krieger, J., D. Li, and D. Papanikolaou. 2021. Missing Novelty in Drug Development*. *The Review of Financial Studies* 35 (2): 636–679. https://doi.org/10.1093/rfs/hhab024.

Lambert, R., C. Leuz, and R. E. Verrecchia. 2007. Accounting Information, Disclosure, and the Cost of Capital. *Journal of Accounting Research* 45 (2): 385–420. https://doi.org/10.1111/j.1475-679X.2007.00238.x.

Lee, K., S. Lee, and G. Sadka. 2024. Impact of ASC 606 on the Cost of Debt: Implications for Expanding the Use of Principles-Based Accounting Standards. *Working paper,* https://doi.org/10.2139/ssrn.4928964.

Lerner, J., and U. Malmendier. 2010. Contractibility and the Design of Research Agreements. *American Economic Review* 100 (1): 214–246. https://doi.org/10.1257/aer.100.1.214.

Lerner, J., and R. P. Merges. 1998. The Control of Technology Alliances: An Empirical Analysis of the Biotechnology Industry. *The Journal of Industrial Economics* 46 (2): 125–156. https://doi.org/10.1111/1467-6451.00066.

Lerner, J., and R. Rajan. 2006. NBER Conference on Corporate Alliances. *Journal of Financial Economics* 80 (1): 1–3. https://doi.org/10.1016/j.jfineco.2006.01.001.

Lerner, J., and A. Seru. 2022. The Use and Misuse of Patent Data: Issues for Finance and Beyond. *The Review of Financial Studies* 35 (6): 2667–2704. https://doi.org/10.1093/rfs/hhab084.

Leuz, C., and P. D. Wysocki. 2016. The Economics of Disclosure and Financial Reporting Regulation: Evidence and Suggestions for Future Research. *Journal of Accounting Research* 54 (2): 525–622. https://doi.org/10.1111/1475-679X.12115.

Lo, A. W. 2021. Can Financial Economics Cure Cancer? *Atlantic Economic Journal* 49 (1): 3–21. https://doi.org/10.1007/s11293-021-09704-7.

Maines, L. A., E. Bartov, P. Fairfield, D. E. Hirst, T. E. Iannaconi, R. Mallett, C. M. Schrand, D. J. Skinner, and L. Vincent. 2003. Evaluating Concepts-Based vs. Rules-Based Approaches to Standard Setting. *Accounting Horizons* 17 (1): 73–89. https://doi.org/10.2308/acch.2003.17.1.73.

Morck, R., A. Shleifer, R. W. Vishny, M. Shapiro, and J. M. Poterba. 1990. The Stock Market and Investment: Is the Market a Sideshow? *Brookings Papers on Economic Activity* 1990 (2): 157–215. https://doi.org/10.2307/2534506.

Murphy, K. M., and R. H. Topel. 2006. The Value of Health and Longevity. *Journal of Political Economy* 114 (5): 871–904. https://doi.org/10.1086/508033.

Nagar, V., J. Schoenfeld, and L. Wellman. 2019. The Effect of Economic Policy Uncertainty on Investor Information Asymmetry and Management Disclosures. *Journal of Accounting and Economics* 67 (1): 36–57. https://doi.org/10.1016/j.jacceco.2018.08.011.

Plumlee, M., Y. Xie, M. Yan, and J. J. Yu. 2015. Bank Loan Spread and Private Information: Pending Approval Patents. *Review of Accounting Studies* 20 (2): 593–638. https://doi.org/10.1007/s11142-014-9304-9.

Robinson, D. T. 2008. Strategic Alliances and the Boundaries of the Firm. *The Review of Financial Studies* 21 (2): 649–681. https://doi.org/10.1093/rfs/hhm084.

Robinson, D. T., and T. E. Stuart. 2007. Financial Contracting in Biotech Strategic Alliances. *The Journal of Law and Economics* 50 (3): 559–596. https://doi.org/10.1086/519811.

Rock, S., S. Sedo, and M. Willenborg. 2000. Analyst Following and Count-Data Econometrics. *Journal of Accounting and Economics* 30 (3): 351–373. https://doi.org/10.1016/S0165-4101(01)00012-X.

Roychowdhury, S., N. Shroff, and R. S. Verdi. 2019. The Effects of Financial Reporting and Disclosure on Corporate Investment: A Review. *Journal of Accounting and Economics* 68 (2): 101246. https://doi.org/10.1016/j.jacceco.2019.101246.

Roychowdhury, S., and S. Srinivasan. 2019. The Role of Gatekeepers in Capital Markets. *Journal of Accounting Research* 57 (2): 295–322. https://doi.org/10.1111/1475-679X.12266.

Schipper, K. 2003. Principles-Based Accounting Standards. *Accounting Horizons* 17 (1): 61–72. https://doi.org/10.2308/acch.2003.17.1.61.

Schipper, K., C. M. Schrand, T. Shevlin, and T. J. Wilks. 2009. Reconsidering Revenue Recognition. *Accounting Horizons* 23 (1): 55–68. https://doi.org/10.2308/acch.2009.23.1.55.

Shroff, N. 2017. Corporate Investment and Changes in GAAP. *Review of Accounting Studies* 22 (1): 1–63. https://doi.org/10.1007/s11142-016-9375-x.

Simpson, A., and A. Tamayo. 2020. Real Effects of Financial Reporting and Disclosure on Innovation. *Accounting and Business Research* 50 (5): 401–421. https://doi.org/10.1080/00014788.2020.1770926.

Stein, J. C. 2008. Conversations among Competitors. *American Economic Review* 98 (5): 2150–2162. https://doi.org/10.1257/aer.98.5.2150.

Thakor, R. T., and A. W. Lo. 2017. Optimal Financing for R&D-Intensive Firms. *Working paper,* https://doi.org/10.2139/ssrn.3034428.

Verrecchia, R. E. 1983. Discretionary Disclosure. *Journal of Accounting and Economics* 5:179–194. https://doi.org/10.1016/0165-4101(83)90011-3.

Watts, R. L., and J. L. Zimmerman. 1979. The Demand for and Supply of Accounting Theories: The Market for Excuses. *The Accounting Review* 54 (2): 273–305.

Williams, B., and B. M. Williams. 2021. Real Effects of Financial Reporting on Innovation: Evidence from Tax Law and Accounting Standards. *The Accounting Review* 96 (6): 397–425. https://doi.org/10.2308/TAR-2018-0582.

Wooldridge, J. M. 2021. Two-Way Fixed Effects, the Two-Way Mundlak Regression, and Difference-in-Differences Estimators. *Working paper,* https://doi.org/10.2139/ssrn.3906345.

VI. APPENDIX A: VARIABLE DEFINITIONS

This table provides definitions for the variables used in the empirical analyses. Average total assets are calculated as the average of total assets at the beginning and end of the quarter $(atq_t + atq_{t-1})/2$. All unbounded continuous variables are winsorized at 1% and 99%.

Variable	Definition	Source
	Main Treatment Variables	
ARD	Alliance Revenue Dependence. The firm's median ratio of quarterly Alliance Revenue to Total Revenue ($revtq$) during the pre-adoption period (2014Q1–2016Q4).	SEC EDGAR, Compustat
$ASC606$	An indicator variable equal to 1 for firm-quarters post-ASC 606 adoption, and 0 otherwise.	SEC EDGAR, Compustat
$ASC606Impact$	The cumulative one-time effect of ASC 606 adoption on retained earnings, as disclosed in the adoption quarter's financial statements, scaled by total assets (atq) at the adoption quarter.	SEC EDGAR, Compustat
$\Delta Disclosure$	Change in $Disclosure$. Calculated as the difference between the average number of words in the revenue and revenue recognition disclosures post-ASC 606 and the average number of words pre-ASC 606. Mean 10-Q disclosures and mean 10-K disclosures are computed separately and averaged to obtain final measure.	SEC EDGAR
$LowCentrality$	An indicator variable equal to 1 if the firm's pre-ASC 606 median Degree Centrality (calculated over 2014-2016) is below the sample median, and 0 otherwise.	Cortellis
	Dependent Variables	
$Bid - Ask$	Quarterly median daily quoted bid-ask spread. Daily spread is calculated as $(ask - bid)/(ask + bid)/2)$.	CRSP
$ClosenessCentrality$	A measure of a firm's centrality in the R&D alliance network. Calculated annually as $(N - 1)/\sum_{j \in N} d(i,j)$, where N is the number of firms in the network and $d(i,j)$ is the shortest path distance based on alliances formed in the prior 5 years.	Cortellis
$DeferredRevenue$	The sum of short-term deferred revenue ($drcq$) and long-term deferred revenue ($drltq$), scaled by average total assets.	Compustat

Continued on next page

Continued from previous page

Variable	Definition	Source
$DegreeCentrality$	A measure of a firm's centrality in the R&D alliance network. Calculated annually as the number of direct connections (as principal or partner) divided by $(N-1)$, where N is the number of firms in the network. Connections based on alliances formed in the prior 5 years.	Cortellis
$Disclosure$	The total word count from paragraphs identified as revenue recognition related within quarterly (10-Q) and annual (10-K) reports. Paragraphs are identified using a Phi-4 instruct model.	SEC EDGAR
$ForwardCitations$	The total number of citations received within 5 years of grant for all patents applied for by the firm in the quarter. The citation count is attributed back to the application quarter.	KPSS, USPTO, Google Patents
$GPIN$	Generalized Probability of Informed Trading. Following Duarte, Hu, and Young (2020), model parameters are estimated annually using NYSE-listed firms. These parameters are then used to compute the daily conditional probability of an information event (CPIE). The firm-quarter measure is the quarterly average of daily CPIE values.	CRSP, TAQ
$NewDebtIssuance$ (Balance Sheet)	Change in total debt. Calculated as the change in debt in current liabilities ($dlcq$) plus the change in long-term debt ($dlttq$), scaled by average total assets.	Compustat
$NewDebtIssuance$ (SDC Platinum)	Total U.S. dollar value ($ millions) of new debt issued by the firm during the quarter.	SDC Platinum
$NewEquityIssuance$ (Balance Sheet)	Change in split-adjusted common shares outstanding. Calculated as the change in common shares outstanding ($cshoq$) times the adjustment factor ($ajexq$), scaled by average total assets.	Compustat
$NewEquityIssuance$ (SDC Platinum)	Total U.S. dollar value ($ millions) of new equity issued by the firm during the quarter.	SDC Platinum
$Number\ of\ DrugCandidates$	Number of drug candidates the firm started in active development during the quarter.	Cortellis, ClinicalTrials.gov, FactSet, S&P CIQ

Continued on next page

Continued from previous page

Variable	Definition	Source
$Number\ of\ Patents$	The total number of patents applied for by the firm in the quarter that are eventually granted. The count is attributed back to the application quarter.	KPSS, USPTO
$PatentValue$	The sum of the estimated economic value for all patents applied for by the firm in the quarter that are eventually granted. The value for each patent is calculated upon grant, following Kogan et al. (2017), and attributed back to its application quarter.	KPSS
$R\&DIntensity$	Research and development expense ($xrdq$) scaled by average total assets. Set to 0 if missing.	Compustat
$PartnerAlliances$ (with Private/Public Firms)	The number of new R&D alliances initiated during the quarter where the firm acts as the *partner* (and the principal is a private/public firm).	Cortellis
$R\&DPrincipalAlliances$	The number of new R&D alliances initiated during the quarter where the firm acts as the *principal*.	Cortellis
$Revenue$	Total quarterly revenue ($revtq$) scaled by average total assets.	Compustat
$SupplyPartnerAlliances$	The number of new supply-only alliances initiated during the quarter where the firm acts as the *partner*.	Cortellis
$SemanticSimilarity$	Cosine similarity score between the Sentence-BERT embedding of the firm's revenue recognition disclosure and the embeddings of representative concept sentences for 'Innovation', 'R&D', 'Progress'.[14]	SEC EDGAR
	Control Variables	
$Cash$	Cash and short-term investments ($cheq$) scaled by average total assets.	Compustat
CFO	Cash Flow from Operations. Quarterly net cash flow from operating activities are computed from year-to-date variable ($oancfy$) and scaled by average total assets.	Compustat
$CFO\ Growth$	Change in CFO scaled by average total assets.	Compustat
$Growth$	Change in total assets scaled by average total assets.	Compustat

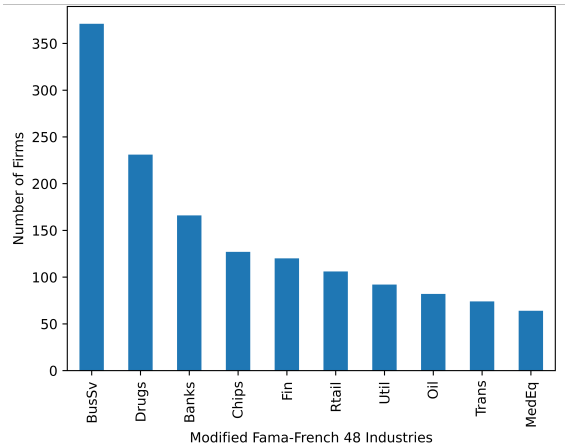
Continued on next page

Continued from previous page

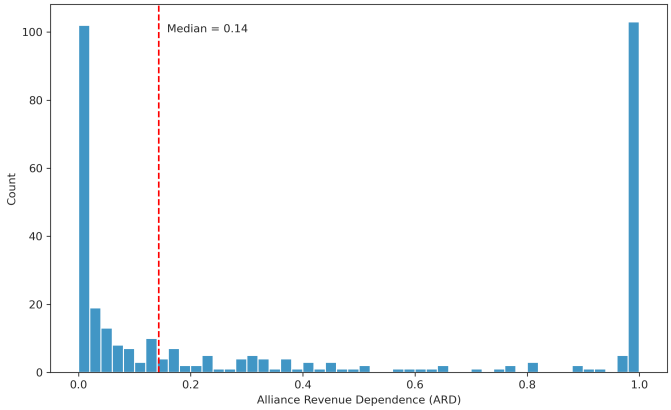
Variable	Definition	Source
$HPIndex$	Financial constraints measure from Hadlock and Pierce (2010). Calculated as $-0.737 \times Size + 0.043 \times Size^2 - 0.040 \times Age$. Where Age is the number of years the firm data available in Compustat.	Compustat
$Leverage$	Total debt (debt in current liabilities, $dlcq$, plus long-term debt, $dlttq$) divided by average total assets.	Compustat
MVE	Market Value of Equity. Closing stock price ($prccq$) multiplied by common shares outstanding ($cshoq$) at the end of the quarter.	Compustat
$Number\ of\ Analysts$	The number of analysts providing earnings forecasts for the firm during the quarter.	I/B/E/S
$Price$	Natural logarithm of the closing stock price ($prccq$) at the end of the quarter.	Compustat
$Return$	The firm's buy-and-hold stock return over the quarter.	CRSP
ROA	Return on Assets. Net income (niq) divided by average total assets.	Compustat
$Sales\ Growth$	Revenue growth. Change in total revenue ($revtq_t - revtq_{t-1}$) divided by lagged total revenue ($revtq_{t-1}$)	Compustat
$Size$	Natural logarithm of total assets (atq) at the end of the quarter.	Compustat
$Std\ Return$	Standard deviation of the firm's daily stock returns during the quarter.	CRSP
$TangibleAssets$	Net property, plant, and equipment ($ppentq$) divided by total assets (atq) at the end of the quarter.	Compustat
$Tobin'sQ$	Calculated as (MVE + Total Debt ($dlcq$+$dlttq$) + Preferred Stock Liquidating Value ($pstkq$) - Deferred Tax Assets ($txditcq$)) divided by Total Assets (atq).	Compustat
$Turnover$	Average quarterly trading volume (sum of daily vol) divided by the average number of shares outstanding ($shrout$) during the quarter.	CRSP
$Volume$	Natural logarithm of the total quarterly trading volume (sum of daily vol).	CRSP

Figure 1: Cross-Sectional Variation in ASC 606 Impact

Panel A: Ten Most Affected Industries by ASC 606



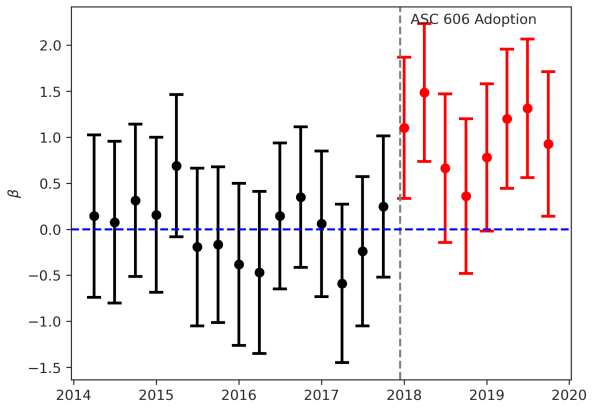
Panel B: Alliance Revenue Dependence (*ARD*) Distribution



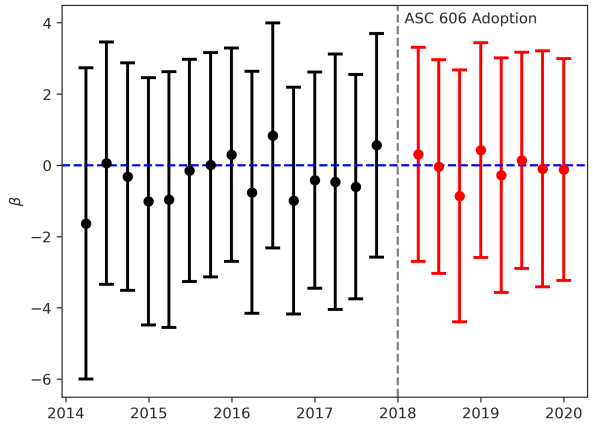
These figures show the cross-sectional variation in ASC 606 impact, examining the most affected industries (Panel A) and the distribution of Alliance Revenue Dependence (Panel B) across sample firms. Panel A presents the number of firms materially affected by ASC 606 across the ten most impacted Fama-French 48 industries. Firms are identified as materially affected using Compustat's 'ACCTCHGQ' variable. Biopharmaceutical firms (SIC 8731) are reclassified into the Drugs industry. Panel B shows the distribution of Alliance Revenue Dependence (ARD_i), measured as the firm-specific median ratio of quarterly alliance revenue to total revenue over the 2014–2016 pre-adoption period to mitigate concerns about strategic revenue stream alterations in anticipation of ASC 606. A higher ARD_i indicates greater expected treatment intensity, as ASC 606 primarily affects alliance-based revenues rather than direct sales.

Figure 2: Parallel Trends in R&D Alliance Formation Around ASC 606 Adoption

Panel A: R&D Partner Alliances



Panel B: R&D Principal Alliances



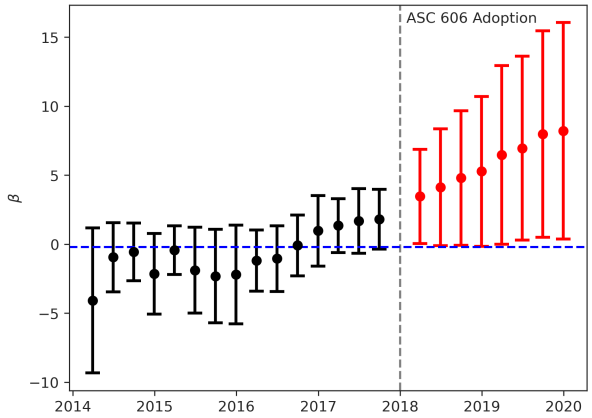
These figures show changes in R&D alliance formation, as measured by the Number of Partner R&D Alliances (Panel A) and Principal R&D Alliances (Panel B), in the quarters around the ASC 606 adoption. The estimates β_t and their 90% confidence intervals are from the following Negative Binomial models:

$$Alliances_{i,t} = \beta_t \sum_{\tau=-15, \tau \neq 0}^{\tau=8} ARD_i \times \mathbb{1}[t = \tau] + \gamma X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t}$$

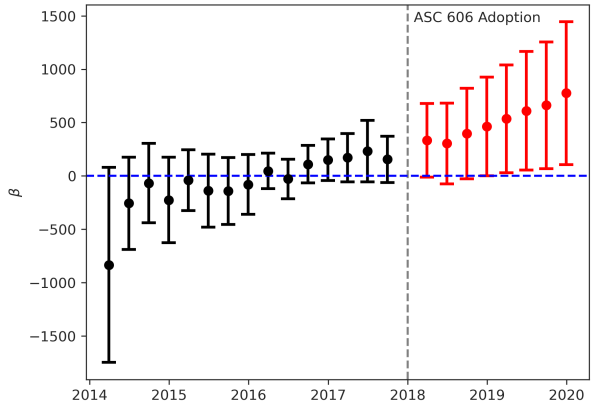
where $\mathbb{1}[t = \tau]$ is a dummy variable indicating the relative quarter around ASC 606 adoption (December 15, 2017). Quarter "0" (2017Q4) is omitted for comparison. $X_{i,t}$ represents time-varying firm-level controls. δ_i and π_t are firm and year fixed effects, respectively. Standard errors are clustered at firm and year-quarter levels. Detailed definitions of all variables are provided in Appendix A.

Figure 3: Parallel Trends in Innovation Around ASC 606 Adoption

Panel A: Number of Patents



Panel B: Patent Values



These figures show changes in innovation quality, as measured by the Raw Number of Patents (Panel A) and Raw Patent Value (Panel B), in the quarters around the ASC 606 adoption. The estimates β_t and their 90% confidence intervals are from the following models:

For Number of Patents:

$$Innovation_{i,t} = \beta_t \sum_{\tau=-15, \tau\neq 0}^{\tau=8} ARD_i \times \mathbb{1}[t=\tau] + \gamma X_{i,t} + \delta_i + \pi_t + \epsilon_{i,t}$$

where $\mathbb{1}[t=\tau]$ is a dummy variable indicating the relative quarter around ASC 606 adoption (December 15, 2017). Quarter '0' (2017Q4) is omitted for comparison. $X_{i,t}$ represents time-varying firm-level controls. δ_i and π_t are firm and year fixed effects, respectively. Standard errors are clustered at the firm and year-quarter levels. Detailed definitions of all variables are provided in Appendix A.

Table 1: Panel A: Descriptive Statistics for pre-ASC 606 Sample Period

	Alliance Revenue Independent					Alliance Revenue Dependent				
	Count	**Mean**	**25%**	**50%**	**75%**	**Count**	**Mean**	**25%**	**50%**	**75%**
Bid-Ask	2059	0.005	0.000	0.001	0.004	2018	0.007	0.001	0.002	0.006
CFO	2490	-0.076	-0.123	-0.045	0.023	2436	-0.121	-0.158	-0.095	-0.045
CFO Growth	2490	6.188	-0.469	-0.036	0.303	2436	-0.010	-0.422	-0.019	0.259
Cash	2490	0.548	0.219	0.518	0.800	2436	0.764	0.508	0.779	0.990
Closeness Centrality	2488	0.055	0.000	0.001	0.115	2436	0.036	0.000	0.000	0.097
Deferred Revenue	2490	0.052	0.000	0.000	0.023	2436	0.149	0.000	0.016	0.123
Degree Centrality	2488	6.107	1.000	2.000	5.000	2436	2.750	1.000	2.000	4.000
Disclosure	2490	1098.682	0.000	720.500	1566.000	2436	1277.191	0.000	705.000	1824.750
Forward Citations	2490	98.869	0.000	0.000	5.000	2436	5.347	0.000	0.000	1.000
GPIN	1415	0.481	0.402	0.503	0.565	1321	0.478	0.351	0.498	0.563
Growth	2490	0.190	-0.073	0.089	0.410	2436	0.215	-0.200	0.113	0.552
HP Index	2490	-3.089	-3.824	-3.084	-2.560	2436	-2.723	-3.163	-2.832	-2.425
Leverage	2490	0.370	0.000	0.153	0.410	2436	0.664	0.000	0.006	0.273
MVE	2434	13870.679	96.670	460.349	2828.826	2294	903.677	70.821	254.987	751.684
New Debt Issuance (BS)	2473	0.011	-0.001	0.000	0.003	2408	0.034	-0.000	0.000	0.000
New Debt Issuance (SDC)	2300	80.631	0.000	0.000	0.000	2340	0.075	0.000	0.000	0.000
New Equity Issuance (BS)	2254	0.050	0.000	0.003	0.018	2250	0.092	0.001	0.005	0.037
New Equity Issuance (SDC)	2300	8.414	0.000	0.000	0.000	2340	10.566	0.000	0.000	0.000
Number of Analysts	2490	10.265	3.000	7.000	15.000	2436	6.901	3.000	6.000	9.000
Number of Drug Candidates	2490	0.416	0.000	0.000	0.000	2436	0.190	0.000	0.000	0.000
Number of Patents	2490	9.512	0.000	0.000	3.000	2436	1.232	0.000	0.000	1.000
Patent Values	2490	847.823	0.000	0.000	63.454	2436	36.102	0.000	0.000	8.520
Price	2434	2.272	1.125	2.386	3.762	2294	1.665	0.743	1.811	2.821
ROA	2490	-0.150	-0.151	-0.054	0.011	2436	-0.157	-0.187	-0.107	-0.057
R&D Intensity	2490	0.091	0.013	0.046	0.099	2436	0.120	0.049	0.085	0.134
R&D Partner Alliances	2490	0.341	0.000	0.000	0.000	2436	0.146	0.000	0.000	0.000
R&D Partner Alliances (Private)	2490	0.008	0.000	0.000	0.000	2436	0.002	0.000	0.000	0.000
R&D Principal Alliances	2490	0.153	0.000	0.000	0.000	2436	0.094	0.000	0.000	0.000
Return	2230	0.046	-0.065	0.011	0.120	2059	0.030	-0.103	-0.002	0.127
Revenue	2490	0.110	0.016	0.080	0.152	2436	0.065	0.000	0.013	0.059
Sales Growth	2490	1.633	-0.062	0.008	0.162	2436	1.522	-0.155	0.000	0.153
Semantic Similarity - Innovation	2488	0.389	0.389	0.460	0.510	2436	0.393	0.392	0.479	0.526
Semantic Similarity - Progress	2488	0.475	0.478	0.562	0.617	2436	0.476	0.474	0.577	0.637
Semantic Similarity - R&D	2488	0.439	0.437	0.513	0.575	2436	0.456	0.448	0.556	0.616
Size	2490	5.409	3.754	4.925	6.934	2436	4.405	3.548	4.566	5.416
Std Return	2229	0.134	0.053	0.102	0.178	2059	0.182	0.085	0.145	0.232
Supply Partner Alliances	2490	0.119	0.000	0.000	0.000	2436	0.057	0.000	0.000	0.000
Tangible Assets	2488	0.099	0.015	0.055	0.134	2436	0.065	0.007	0.021	0.060
Tobin'sQ	2434	5.135	1.813	2.847	4.795	2294	5.605	1.822	2.994	4.743
Turnover	2243	0.016	0.004	0.007	0.014	2136	0.014	0.003	0.006	0.011
Volume	2231	17.287	16.284	17.431	18.324	2062	16.952	16.105	17.030	17.931

Table 1: Panel B: Descriptive Statistics for post-ASC 606 Sample Period

	Alliance Revenue Independent					Alliance Revenue Dependent				
	Count	**Mean**	**25%**	**50%**	**75%**	**Count**	**Mean**	**25%**	**50%**	**75%**
Bid-Ask	1106	0.006	0.000	0.001	0.005	1197	0.006	0.001	0.002	0.006
CFO	1273	-0.077	-0.129	-0.047	0.020	1339	-0.106	-0.145	-0.095	-0.049
CFO Growth	1273	0.505	-0.456	-0.028	0.295	1339	-0.612	-0.333	-0.016	0.287
Cash	1273	0.492	0.173	0.453	0.756	1339	0.696	0.467	0.719	0.930
Closeness Centrality	1265	0.048	0.000	0.001	0.103	1339	0.035	0.000	0.000	0.092
Deferred Revenue	1273	0.061	0.000	0.000	0.012	1339	0.090	0.000	0.005	0.092
Degree Centrality	1265	6.160	1.000	2.000	6.000	1339	2.719	1.000	2.000	4.000
Disclosure	1273	1848.746	191.000	1274.000	2620.000	1339	2198.343	298.000	1513.000	3230.500
Forward Citations	1273	6.251	0.000	0.000	0.000	1339	0.497	0.000	0.000	0.000
GPIN	672	0.477	0.390	0.503	0.564	780	0.468	0.339	0.502	0.572
Growth	1273	0.096	-0.137	0.052	0.259	1339	0.085	-0.235	0.065	0.388
HP Index	1273	-3.246	-3.958	-3.242	-2.665	1339	-2.897	-3.288	-2.997	-2.628
Leverage	1273	0.373	0.028	0.208	0.424	1339	0.310	0.000	0.091	0.380
MVE	1269	15756.282	71.893	470.809	2676.802	1325	1341.786	83.221	273.444	941.657
New Debt Issuance (BS)	1265	0.017	-0.002	0.000	0.010	1339	0.010	-0.001	0.000	0.006
New Debt Issuance (SDC)	1179	86.509	0.000	0.000	0.000	1292	0.000	0.000	0.000	0.000
New Equity Issuance (BS)	1179	0.052	0.000	0.002	0.013	1290	0.064	0.001	0.005	0.042
New Equity Issuance (SDC)	1179	5.253	0.000	0.000	0.000	1292	14.900	0.000	0.000	0.000
Number of Analysts	1273	10.469	4.000	7.000	15.000	1339	7.653	4.000	7.000	10.000
Number of Drug Candidates	1273	0.252	0.000	0.000	0.000	1339	0.141	0.000	0.000	0.000
Number of Patents	1273	3.056	0.000	0.000	1.000	1339	0.501	0.000	0.000	0.000
Patent Values	1273	335.812	0.000	0.000	18.402	1339	18.320	0.000	0.000	0.000
Price	1264	2.137	0.769	2.155	3.867	1325	1.806	0.833	1.825	2.844
ROA	1273	-0.139	-0.157	-0.059	0.010	1339	-0.161	-0.178	-0.108	-0.058
R&D Intensity	1273	0.080	0.012	0.042	0.098	1339	0.099	0.047	0.082	0.125
R&D Partner Alliances	1273	0.370	0.000	0.000	0.000	1339	0.173	0.000	0.000	0.000
R&D Partner Alliances (Private)	1273	0.005	0.000	0.000	0.000	1339	0.006	0.000	0.000	0.000
R&D Principal Alliances	1273	0.127	0.000	0.000	0.000	1339	0.099	0.000	0.000	0.000
Return	1185	0.018	-0.097	-0.003	0.097	1222	0.001	-0.135	-0.025	0.104
Revenue	1273	0.108	0.023	0.084	0.144	1339	0.064	0.001	0.017	0.076
Sales Growth	1273	0.978	-0.074	0.008	0.129	1339	4.326	-0.192	0.000	0.222
Semantic Similarity - Innovation	1265	0.413	0.423	0.487	0.522	1339	0.427	0.438	0.502	0.536
Semantic Similarity - Progress	1265	0.494	0.503	0.580	0.627	1339	0.513	0.508	0.600	0.652
Semantic Similarity - R&D	1265	0.461	0.473	0.535	0.586	1339	0.489	0.493	0.574	0.617
Size	1273	5.687	3.936	5.332	7.315	1339	4.714	3.871	4.869	5.809
Std Return	1184	0.151	0.062	0.116	0.192	1221	0.185	0.088	0.150	0.229
Supply Partner Alliances	1273	0.085	0.000	0.000	0.000	1339	0.071	0.000	0.000	0.000
Tangible Assets	1265	0.119	0.025	0.076	0.174	1339	0.080	0.011	0.041	0.102
Tobin'sQ	1269	3.645	1.470	2.385	3.773	1325	4.097	1.517	2.687	4.596
Turnover	1188	0.012	0.004	0.006	0.011	1256	0.012	0.004	0.007	0.011
Volume	1180	17.489	16.742	17.616	18.336	1222	17.101	16.448	17.199	17.888

This table presents descriptive statistics for variables for both pre-ASC 606 (Panel A) and post-ASC 606 (Panel B) periods for Alliance Revenue Dependent and Independent Firms. Descriptive statistics are calculated whenever there are non-missing data available. All continuous variables are winsorized at 1% and 99% levels. Variable descriptions are available in Appendix A.

Table 2: The Effect of ASC 606 on Financial Statements and Disclosures

Panel A: The Effect of ASC 606 on Financial Statements in Revenue, Deferred Revenue, and Revenue Disclosures

	Revenue	Deferred Revenue	Disclosure
	(1)	(2)	(3)
$ARD \times ASC606$	0.180***	-0.030***	382.040***
	(0.016)	(0.006)	(62.028)
Firm FE	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Observations	7,538	7,538	7,538
R^2	0.204	0.599	0.586
Adj. R^2	0.163	0.579	0.565
Note:			*p<0.1; **p<0.05; ***p<0.01

Panel B: Revenue Recognition Disclosure Content

	Semantic Similarity Progress	Semantic Similarity Innovation	Semantic Similarity R&D
	(1)	(2)	(3)
$ARD \times ASC606$	0.044***	0.034**	0.039**
	(0.012)	(0.011)	(0.012)
Firm FE	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Observations	7,538	7,538	7,538
R^2	0.572	0.582	0.589
Adj. R^2	0.551	0.561	0.568
Note:			*p<0.1; **p<0.05; ***p<0.01

This table presents difference-in-differences (DiD) regression results examining the impact of ASC 606 on financial statements (Panel A) and the semantic content of revenue recognition disclosures (Panel B). Panel A examines the effect on *Revenue*, *Deferred Revenue*, and *Disclosure* through regressions on $ARD \times ASC606$, where *Revenue* and *Deferred Revenue* variables are log transformed. Panel B analyzes the effect on semantic similarity between firms' revenue recognition disclosures and three key innovation-related concepts: *Progress*, *Innovation*, and *R&D*, where higher values indicate greater semantic alignment between disclosure content and these concepts. The unit of observation is at the firm-quarter level. Firm fixed and year-quarter fixed effects are included in all specifications, with the main effects of ARD and ASC606 absorbed by the fixed effects. Standard errors are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 3: The Effect of ASC 606 on Information Asymmetry

	Bid-Ask		GPIN	
	(1)	(2)	(3)	(4)
$ASC606 \times ARD$	-0.163***		-0.033**	
	(0.051)		(0.016)	
$ASC606 \times ASC606$ Impact		1.170*		0.416**
		(0.615)		(0.166)
$ASC606 \times \Delta Disclosure$		0.068		-0.005
		(0.045)		(0.011)
$ASC606 \times ASC606Impact \times \Delta Disclosure$		-3.486***		-0.699***
		(1.047)		(0.256)
$Size$	-0.109***	-0.100***	0.010	0.012
	(0.024)	(0.023)	(0.007)	(0.007)
$Leverage$	0.092**	0.081**	0.033**	0.032**
	(0.038)	(0.039)	(0.013)	(0.013)
$Numberof Analysts$	-0.011**	-0.012**	0.001	0.001
	(0.005)	(0.005)	(0.001)	(0.001)
$Turnover$	-0.013	-0.015	-0.001	-0.001
	(0.014)	(0.015)	(0.003)	(0.003)
$Price$	-0.568***	-0.569***	-0.006	-0.007
	(0.020)	(0.020)	(0.005)	(0.004)
$Volume$	-0.298***	-0.303***	0.006	0.005
	(0.019)	(0.019)	(0.005)	(0.005)
$StdReturn$	0.296**	0.301**	0.001	0.002
	(0.118)	(0.117)	(0.030)	(0.030)
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Observations	6,354	6,354	4,071	4,071
R^2	0.800	0.800	0.250	0.250
Adjusted R^2	0.789	0.789	0.195	0.194

Note: *p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results examining the impact of ASC 606 on information asymmetry. Columns (1) and (3) show the main treatment effects of *ARD* × *ASC606* on log transformed bid-ask spreads and GPIN, respectively. Columns (2) and (4) examine the joint effects by including interactions between *ASC606Impact* (magnitude of accounting change), Δ*Disclosure* (change in disclosure quantity), and their three-way interaction with *ASC606*. The unit of observation is firm-quarter level. Firm and year-quarter fixed effects are included in all specifications. The main effects of ARD and ASC606 are absorbed by the fixed effects. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 4: The Impact of ASC 606 on Access to Capital

	New Equity Issuance (Balance Sheet)	**New Debt Issuance** (Balance Sheet)	**New Equity Issuance** (SDC Platinum)	**New Debt Issuance** (SDC Platinum)
	(1)	**(2)**	**(3)**	**(4)**
$ARD \times ASC606$	0.018**	-0.002	9.865***	-8.905
	(0.007)	(0.006)	(3.655)	(32.630)
ROA	-0.024	-0.018	1.278	13.777
	(0.020)	(0.014)	(2.906)	(8.622)
$TangibleAssets$	-0.074***	0.105**	-26.794***	-122.920*
	(0.021)	(0.052)	(6.531)	(64.081)
$Size$	0.002	0.027***	13.862***	11.207
	(0.008)	(0.007)	(3.148)	(9.864)
$Growth$	0.056***	0.009**	3.141	33.012**
	(0.008)	(0.004)	(1.965)	(13.382)
$SalesGrowth$	0.000	0.0001*	-0.008	0.024
	(0.000)	(0.000)	(0.007)	(0.015)
CFO	0.001	-0.152*	-20.850***	-41.424***
	(0.023)	(0.084)	(5.047)	(15.602)
$CFOGrowth$	0.000	0.000	-0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.001)
$Return$	0.048**	0.004	5.663**	-9.199
	(0.022)	(0.005)	(2.338)	(8.824)
$Price$	-0.032***	-0.004	1.822**	-7.341
	(0.007)	(0.002)	(0.902)	(8.230)
Year-Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	6,686	6,686	6,386	6,386
R^2	0.206	0.100	0.136	0.138
Adjusted R^2	0.161	0.049	0.087	0.089

Note: *p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results examining the impact of ASC 606 on access to capital. The dependent variables are *New Equity Issuance* and *New Debt Issuance* measured using both balance sheet data (Columns 1-2) and SDC Platinum database (Columns 3-4). The unit of observation is firm-quarter level. Firm and year-quarter fixed effects are included in all specifications. The main effects of ARD and ASC606 are absorbed by the fixed effects. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 5: The Impact of ASC 606 on R&D Investment

	R&D Intensity	R&D Partner Alliances	R&D Partner Alliances
	(1)	(2)	(3)
ARD			-0.804***
			(0.092)
$ASC606$			-0.810***
			(0.069)
$ARD \times ASC606$	0.018**	0.075**	1.083***
	(0.008)	(0.036)	(0.141)
MVE_{t-1}	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)
$TobinQ_{t-1}$	0.001***	0.001*	-0.030***
	(0.000)	(0.000)	(0.006)
CFO	-0.098**	0.055**	0.576***
	(0.046)	(0.022)	(0.191)
$Cash_{t-1}$	0.091***	0.354***	-1.542***
	(0.007)	(0.047)	(0.075)
$Growth_{t-1}$	-0.022***	-0.065***	0.302***
	(0.004)	(0.022)	(0.063)
ROA_{t-1}	0.000	-0.001***	0.011
	(0.000)	(0.000)	(0.026)
Model	OLS	OLS	Negative Binomial
Year-Quarter FE	Yes	Yes	No
Firm FE	Yes	Yes	No
Observations	7213	7213	7213
R^2	0.600	0.110	
Adjusted R^2	0.579	0.062	
(Pseudo) R^2			0.083
Note:			*p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results examining the impact of ASC 606 on R&D investments. Column (1) shows the effect on *R&D Intensity*. Columns (2) and (3) examine the effect on *R&D Partner Alliances*. Columns (1) and (2) use OLS estimation with firm and year-quarter fixed effects. Column (3) uses Negative Binomial regression without fixed effects due to incidental parameters concerns. For the Negative Binomial model, the main effects of ARD and ASC606 are included as they are not absorbed by fixed effects. The unit of observation is firm-quarter level. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 6: The Impact of ASC 606 on Innovation

	Number of Patents	Forwards Citations	Patent Value	Number of Drug Candidates
	(1)	(2)	(3)	(4)
$ARD \times ASC606$	0.157***	0.248***	0.211**	0.118***
	(0.055)	(0.091)	(0.097)	(0.042)
ROA	-0.000	-0.001	-0.001	-0.003***
	(0.000)	(0.000)	(0.001)	(0.001)
HPI	-0.411***	-0.808***	-0.987***	-0.124
	(0.094)	(0.163)	(0.234)	(0.081)
$Size$	-0.134**	-0.363***	-0.293**	-0.024
	(0.056)	(0.097)	(0.139)	(0.048)
Year-Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	7528	7528	7528	7528
R^2	0.672	0.437	0.681	0.155
Adjusted R^2	0.656	0.409	0.665	0.112
Note:				*p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results examining the impact of ASC 606 on innovation outcomes. The dependent variables are: *Number of Patents*, *Forward Citations*, *Patent Value* and *Number of Drug Candidates*. All patent measures are log-transformed as log(1 + raw measure). The unit of observation is firm-quarter level. Firm and year-quarter fixed effects are included in all specifications. The main effects of ARD and ASC606 are absorbed by the fixed effects. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 7: Placebo Tests for The Impact of ASC 606 on R&D Investment

	Supply Partner Alliances	Supply Partner Alliances	R&D Principal Alliances	R&D Principal Alliances
	(1)	(2)	(3)	(4)
ARD	-0.535**		-0.187	
	(0.243)		(0.227)	
ASC606	-0.036		-0.225**	
	(0.203)		(0.107)	
$ARD \times ASC606$	0.318	0.020	0.290	0.016
	(0.348)	(0.012)	(0.274)	(0.011)
MVE_{t-1}	0.000***	-0.000**	0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$TobinsQ_{t-1}$	0.000	0.000	0.003	0.000
	(0.005)	(0.000)	(0.005)	(0.000)
CFO	0.333	0.002	0.216	0.004
	(0.397)	(0.010)	(0.364)	(0.008)
$Cash_{t-1}$	-0.163	0.010	-0.319	0.013
	(0.288)	(0.012)	(0.276)	(0.015)
$Growth_{t-1}$	-0.025	-0.006	0.290**	0.004
	(0.226)	(0.007)	(0.128)	(0.007)
ROA_{t-1}	-0.003	0.000	-0.021	-0.000***
	(0.006)	0.000	(0.015)	(0.000)
Model	Negative Binomial	OLS	Negative Binomial	OLS
Year-Quarter FE	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes
Observations	7,209	7,209	7,209	7,209
R^2		0.133		0.285
Adjusted R^2		0.086		0.247
Pseudo R^2	0.018		0.037	

Note: *p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results for placebo tests examining the impact of ASC 606 on non-R&D alliance activities. The dependent variables are *Supply Partner Alliances* (Columns 1-2) and *R&D Principal Alliances* (Columns 3-4). Columns (1) and (3) use Negative Binomial regression for the count-dependent variables. Columns (2) and (4) use OLS with log-transformed dependent variables. For Negative Binomial models, only year-quarter fixed effects are included due to incidental parameters concerns, while OLS models include both firm and year-quarter fixed effects. The main effects of ARD and ASC606 are included in Negative Binomial models as they are not absorbed by fixed effects. The unit of observation is firm-quarter level. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 8: Cross Sectional Test for Alliance Formation - Private Principals

	R&D Partner Alliances		
	with Private Firms	**with Public Firms**	**Difference (1)-(2)**
	(1)	**(2)**	
ARD	-2.230**	-0.606***	
	(1.081)	(0.225)	
$ASC606$	-1.763***	-0.402***	
	(0.581)	(0.090)	
$ARD \times ASC606$	3.139**	0.489*	2.649*
	(1.360)	(0.265)	(1.386)
MVE_{t-1}	-0.498***	0.013	
	(0.126)	(0.030)	
$TobinsQ_{t-1}$	-0.002	-0.020*	
	(0.004)	(0.011)	
CFO	0.404	1.183*	
	(0.732)	(0.621)	
$Cash_{t-1}$	-2.433***	-1.600***	
	(0.903)	(0.269)	
$Growth_{t-1}$	0.323	0.567***	
	(0.395)	(0.128)	
ROA_{t-1}	-0.071	0.010	
	(0.108)	(0.008)	
Model	Negative Binomial	Negative Binomial	
Year-Quarter FE	No	No	
Firm FE	No	No	
Observations	7,209	7,209	
Pseudo R^2	0.010	0.010	
Note:			*p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results for cross-sectional tests examining alliance formation with private versus public principals. The dependent variables are *R&D Partner Alliances with Private Firms* (Column 1) and *R&D Partner Alliances with Public Firms* (Column 2), representing the quarterly count of new R&D alliances where the sample firm acts as partner and the principal is a private or public firm, respectively. The third column shows the difference between coefficients in Columns (1) and (2) with statistical significance testing. Both models use Negative Binomial regression without fixed effects due to incidental parameters concerns. The main effects of ARD and ASC606 are included as they are not absorbed by fixed effects. The unit of observation is firm-quarter level. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 9: Cross Sectional Tests for Alliance Formation - Network Centrality

	R&D Partner Alliances	
	(1)	(2)
$ASC606$	-0.332***	
	(0.069)	
ARD	-0.682***	
	(0.094)	
$LowCentrality$	-1.283***	
	(0.075)	
$ARD \times ASC606$	0.090	-0.010
	(0.167)	(0.017)
$ARD \times LowCentrality \times ASC606$	1.374***	0.030**
	(0.192)	(0.013)
MVE_{t-1}	0.023***	0.008
	(0.005)	(0.005)
$TobinQ_{t-1}$	-0.008	0.000
	(0.005)	(0.000)
CFO	0.644***	0.022**
	(0.201)	(0.011)
$Cash_{t-1}$	-1.343***	0.025**
	(0.080)	(0.013)
$Growth_{t-1}$	0.238***	0.004
	(0.064)	(0.008)
ROA_{t-1}	0.009	-0.000
	(0.015)	(0.000)
Model	Negative Binomial	OLS
Year-Quarter FE	No	Yes
Firm FE	No	Yes
Observations	7213	7213
R^2		0.147
Adjusted R^2		0.101
(Pseudo) R^2	0.070	
Note:	*p<0.1; **p<0.05; ***p<0.01	

This table presents DiD regression results for cross-sectional tests examining alliance formation based on network centrality. The dependent variable is *R&D Partner Alliances*. Column (1) uses Negative Binomial regression without fixed effects due to incidental parameters concerns. Column (2) uses OLS with firm and year-quarter fixed effects. For the Negative Binomial model, main effects of ARD, ASC606, and LowCentrality are included as they are not absorbed by fixed effects. The unit of observation is firm-quarter level. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 10: Cross Sectional Tests for Innovation

	Number of Patents	Forwards Citations	Patent Value	Number of Drug Candidates
	(1)	(2)	(3)	(4)
$ARD \times ASC606$	0.052	0.118	0.012	0.090***
	(0.061)	(0.110)	(0.110)	(0.027)
$ARD \times LowCentrality \times ASC606$	0.204***	0.249**	0.381***	0.053*
	(0.053)	(0.103)	(0.123)	(0.032)
ROA	-0.000	-0.001	-0.001	-0.003
	(0.000)	(0.000)	(0.001)	(0.003)
HPI	-0.414***	-0.812***	-0.992***	-0.127***
	(0.094)	(0.164)	(0.234)	(0.048)
$Size$	-0.134**	-0.364***	-0.294**	-0.025
	(0.056)	(0.098)	(0.139)	(0.028)
Year-Quarter FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	7451	7451	7451	7451
R^2	0.677	0.441	0.685	0.155
Adjusted R^2	0.660	0.413	0.669	0.112

Note: *p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results for cross-sectional tests examining innovation outcomes based on network centrality. The dependent variables are *Number of Patents* (Column 1), *Forward Citations* (Column 2), *Patent Value* (Column 3), and *Number of Drug Candidates* (Column 4). All patent measures are log-transformed as log(1 + raw measure). The unit of observation is firm-quarter level. Firm and year-quarter fixed effects are included in all specifications. The main effects of ARD and ASC606 are absorbed by the fixed effects. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.

Table 11: The Impact of ASC 606 on the Alliance Network

	Closeness Centrality		Degree Centrality	
	(1)	(2)	(3)	(4)
$ARD \times ASC606$	0.097***	0.008**	2.578***	0.032*
	(0.009)	(0.004)	(0.237)	(0.016)
MVE_{t-1}		0.007***		0.198***
		(0.000)		(0.001)
$TobinsQ_{t-1}$		-0.000		-0.001***
		(0.000)		(0.000)
CFO		-0.003*		-0.061***
		(0.002)		(0.023)
$Cash_{t-1}$		-0.006		-0.013
		(0.004)		(0.014)
$Growth_{t-1}$		-0.001		-0.073***
		(0.002)		(0.010)
ROA_{t-1}		-0.000*		-0.002**
		(0.000)		(0.001)
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Observations	7528	7199	7528	7199
R^2	0.246	0.707	0.295	0.931
Adjusted R^2	0.208	0.691	0.260	0.928
Note:				*p<0.1; **p<0.05; ***p<0.01

This table presents DiD regression results examining the impact of ASC 606 on alliance network structure. The dependent variables are *Closeness Centrality* (Columns 1-2) and *Degree Centrality* (Columns 3-4). All centrality measures are log-transformed as log(1 + raw measure). Columns (1) and (3) show results without control variables, while Columns (2) and (4) include the full set of controls. The unit of observation is firm-quarter level. Firm and year-quarter fixed effects are included in all specifications. The main effects of ARD and ASC606 are absorbed by the fixed effects. Standard errors, reported below coefficient estimates in parentheses, are clustered at firm and year-quarter levels. All continuous variables are winsorized at 1% and 99% levels. Variable definitions are available in Appendix A.