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# How Does Supply Chain Transparency Influence Idiosyncratic Risk in Newly Public Firms: The Moderating Role of Firm Digitalization



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# How Does Supply Chain Transparency Influence Idiosyncratic Risk in Newly Public Firms: The Moderating Role of Firm Digitalization

**Structured abstract**

**Purpose:** This study seeks to explore the intricate relationship among supply chain transparency, digitalization, and idiosyncratic risk, with a specific focus on newly public firms. The objective is to determine whether supply chain transparency effectively mitigates idiosyncratic risk within this context and to understand the potential impact of digitalization on this dynamic interplay.

**Design/methodology/approach**: The study utilizes data from Initial Public Offerings (IPOs) on China's Growth Enterprise Board (ChiNext) over the last five years, sourced from the CSMAR database and firms' annual reports. The research covers the period from 2009 to 2021, observing each firm for five years post-IPO. The final sample comprises 2645 observations from 529 firms. The analysis employs the Hausman test, considering the panel-data structure of the sample and favoring fixed effects over random effects. Additionally, it applies the high-dimensional fixed effects (HDFE) estimator to address unobserved heterogeneity.

**Findings**: The analysis initially uncovered an inverted U-shaped relationship between supply chain transparency and idiosyncratic risk, indicating a delicate equilibrium where detrimental effects diminish and beneficial effects accelerate with increased transparency. Moreover, this inverted U-shaped relationship was notably more pronounced in newly public firms with a heightened level of firm digitalization. This observation implies that firm digitalization amplifies the impact of transparency on a firm's idiosyncratic risk.

**Originality**: This study distinguishes itself by providing distinctive insights into supply chain transparency and idiosyncratic risk. Initially, we introduce and substantiate an inverted U-shaped correlation between supply chain transparency and idiosyncratic risk, challenging the conventional linear perspective. Secondly, we pioneer the connection between supply chain transparency and idiosyncratic risk, especially for newly public firms, thereby enhancing comprehension of financial implications. Lastly, we pinpoint crucial digital conditions that influence the relationship between supply chain transparency and idiosyncratic risk management, offering a nuanced perspective on the role of technology in risk management.

**Keywords:** *Digitalization, Idiosyncratic risk, Supply chain transparency, Newly public firms, Post-IPOs*

## 1. Introduction

Contemporary corporate operations are increasingly guided by stakeholder theory, emphasizing responsibilities beyond shareholder interests (Freeman et al., 2010). In the realm of supply chain management, supply chain transparency has emerged as a crucial concept, encompassing the open communication of supply chain information (Sodhi & Tang, 2019). While transparency offers benefits such as assuring consumers of ethical sourcing and serving as a competitive advantage for firms (Doorey, 2011; Sodhi & Tang, 2019), it also poses risks, including exposure of competitive insights and reputational damage (Birkey et al., 2018; Gardner et al., 2019).

Newly public firms face unique challenges in managing idiosyncratic risks during their transition to public markets, highlighting the significance of effective risk management strategies (Chen & Zheng, 2021; Fischer & Pollock, 2004). This study explores how supply chain transparency influences idiosyncratic risk in newly public firms, with digitalization moderating this relationship. The research hypothesizes digitalization's potential to amplify both the positive and negative effects of supply chain transparency on idiosyncratic risk and aims to provide guidance to firms on effectively managing these dynamics.

The rapid proliferation of digital technologies in the context of Industry 4.0 has been a compelling force driving firms to integrate digitalization across their operations, including supply chain operations. This digital transformation presents both opportunities and challenges. Digitalization encompasses various elements, including cloud computing, artificial intelligence, and blockchain, which have significantly reshaped firms' supply chain management and overall operations (Holmström et al., 2019; Kronblad, 2020; Wielgos et al., 2021; Zeng et al., 2022). However, existing literature also highlights potential drawbacks, such as data security concerns, the increasing complexity of managing digital systems, and the need for significant investment in digital infrastructure and skills development (Son et al., 2021).

To scrutinize these hypotheses, we have curated a dataset encompassing newly public firms listed on the Growth Enterprise Market of the Shenzhen Stock Exchanges, spanning from 2009 to 2022. We extracted financial data from the CSMAR databases, supplementing it with manually coded information on supply chain disclosure from each firm's annual reports. This meticulous approach was chosen to construct a comprehensive dataset. Aligned with the methodology applied by Mishra and Modi (2013), we leveraged monthly financial data and a four-factor asset pricing model (FF4, Carhart 1997) to calculate idiosyncratic risk at the firm-year level. This method affords us the precision needed to examine the nuanced impacts of supply chain transparency and digitalization on a firm's idiosyncratic risk.

In short, this study seeks to explore the relationship between supply chain transparency and idiosyncratic risk in the newly public, bolstered by digital innovation. This study contributes significantly to both academic literature and practical applications. It validates an inverted U-shaped relationship, enriching the existing discourse in academia. Our findings hold implications for newly public firms, suggesting that supply chain transparency can generate detrimental effects impacting idiosyncratic risk management. Secondly, we delineate the impact of firm digitalization on supply chain transparency and risk management. Our findings caution newly public firms that digitalization can intensify both the beneficial and detrimental effects of supply chain transparency. Finally, this study underscores stakeholder theory, providing insights into managing supply chain transparency as an effective communication tool with stakeholders.

The paper is structured as follows. It begins with an introduction, followed by the theoretical background and research hypotheses. Next, the research methodology, including sample selection, variables, and estimation models, is outlined. The subsequent section presents the analysis of panel regressions and robustness checks. The paper concludes with discussions

on theoretical and practical implications, managerial insights, and limitations, along with suggestions for future research.

## 2. Theoretical Background and Hypothesis Development

### 2.1 Stakeholder Theory and Supply Chain Transparency Management

Stakeholder theory has revolutionized organizational responsibilities by advocating for corporations to consider the interests of all stakeholders, not just shareholders (Freeman et al., 2010). This approach is particularly relevant in supply chain management, where effective management of stakeholder relationships hinges on the quality and transparency of information exchange (De Gooyert et al., 2017). Recognizing stakeholders as active participants, with their decisions influenced by the information they receive, underscores the importance of robust information management practices (Co & Barro, 2009).

Adopting stakeholder theory in supply chain management necessitates a departure from traditional linear communication models towards dynamic, iterative approaches that cater to diverse stakeholder needs (Taylor & Rosca, 2023). Different stakeholders, such as consumers, regulators, shareholders, and suppliers, have distinct informational requirements ranging from environmental sustainability to demand forecasts (Zu & Kaynak, 2012). Integrating stakeholder theory into supply chain information management requires meticulous data collection and analysis to effectively tailor information dissemination to meet these varied needs.

Proactive transparency emerges as a cornerstone of this integrated approach, emphasizing the anticipation of stakeholder information needs and voluntary disclosure of critical information (Walker et al., 2014). By engaging in transparent and collaborative communication initiatives, organizations can build trust and accountability within the supply chain ecosystem, contributing to its sustainability and ethical operation (Longoni & Cagliano, 2018). In summary, incorporating stakeholder theory into supply chain information

management entails strategic and transparent information practices that anticipate and fulfill the diverse needs of stakeholders, thereby enhancing the resilience and efficiency of supply chain systems.

**2.2 The Benefits and Drawbacks of Supply Chain Transparency**

Stakeholder theory has fundamentally reshaped corporate responsibilities, urging firms to consider the interests of all stakeholders beyond just shareholders (Freeman et al., 2010). This paradigm shift is particularly pertinent in supply chain management, where the effectiveness of stakeholder relationships relies heavily on transparent information exchange (De Gooyert et al., 2017). Recognizing stakeholders as active participants underscores the necessity of robust information management practices (Co & Barro, 2009).

Applying stakeholder theory in supply chain management requires a departure from linear communication models to more dynamic approaches that address diverse stakeholder needs (Taylor & Rosca, 2023). Stakeholders, including consumers, regulators, shareholders, and suppliers, have varied informational requirements spanning environmental sustainability to demand forecasts (Zu & Kaynak, 2012). Integrating stakeholder theory necessitates thorough data collection and analysis to customize information dissemination effectively.

Proactive transparency is pivotal in this integrated approach, emphasizing anticipation of stakeholder information needs and voluntary disclosure of crucial information (Walker et al., 2014). Through transparent and collaborative communication efforts, organizations can foster trust and accountability in the supply chain ecosystem, bolstering its sustainability and ethical operation (Longoni & Cagliano, 2018). In essence, embracing stakeholder theory in supply chain information management demands strategic and transparent information practices that cater to diverse stakeholder needs, ultimately enhancing supply chain resilience and efficiency.

**2.3 The Influence of Supply Chain Transparency**

In response to mounting demands from a diverse array of stakeholders, companies are under increasing pressure to enhance the transparency of their operations, product development, and practices (Fischer & Pollock, 2004). This necessitates a commitment to supply chain transparency, which encompasses the thorough communication and disclosure of essential information regarding various aspects of the supply chain, including sourcing, manufacturing processes, costs, and logistics (Meixell & Luoma, 2015). Such transparency initiatives require companies to disseminate organizational details to both internal stakeholders, such as supply chain partners and employees, and external entities, including customers, investors, and governmental bodies (Sodhi & Tang, 2019).

While research has highlighted the numerous benefits associated with supply chain transparency, including improved governance, sustainability, traceability, and resilience within the supply chain (Montecchi et al., 2021; Nyamah et al., 2022), it also acknowledges potential risks. These risks may include negative customer reactions, unfavorable responses from governance and investors, and challenges and costs associated with data collection (Sodhi & Tang, 2019). However, despite extensive theoretical discussions on these potential risks, empirical evidence supporting them remains relatively scarce, indicating a notable gap in the existing literature. This study aims to address this gap by exploring both the benefits and drawbacks of supply chain transparency, particularly within the context of newly public firms.

**2.2 Relationship between supply chain transparency and idiosyncratic risk**

Supply chain transparency is a critical aspect for newly public firms, presenting a complex balance of advantages and drawbacks that significantly influence organizational risk (Freeman et al., 2010; Sodhi & Tang, 2019). This study unveils an inverted U-shaped relationship between supply chain transparency and idiosyncratic risk, demonstrating a delicate interplay between diminishing detrimental effects and escalating beneficial effects (Fischer & Pollock, 2004; Garg et al., 2019). As firms undergo the transition to public markets, supply chain transparency poses

initial challenges exacerbated by the "liability of newness" associated with Initial Public Offerings (IPOs), requiring strategic adaptation to meet the demands of public ownership (Fischer & Pollock, 2004).

The challenges stemming from supply chain transparency during this transitional phase are manifold. Initially, firms face hurdles related to information acquisition, verification, and disclosure, entailing significant financial and logistical burdens (Sodhi & Tang, 2019). For instance, tracing and validating the source of every ingredient in products can be a costly and time-intensive endeavor, diverting attention and resources from core business activities. Additionally, there is a pervasive risk associated with divulging competitive advantages or vulnerabilities within the supply chain (Gardner et al., 2019; Morgan et al., 2023). Disclosing proprietary information could expose firms to imitation by competitors or tarnish their brand reputation through association with ethically questionable suppliers (Sodhi & Tang, 2019). The risk of relinquishing deniability further compounds these challenges, as firms lose the ability to disavow knowledge of supplier misconduct, facing potential backlash from consumers and investors (Doorey, 2011).

Despite these initial hurdles, the positive effects of supply chain transparency on idiosyncratic risk exhibit an accelerating trajectory. As supply chain transparency surpasses a certain threshold, the counteracting forces gain momentum, resulting in a more rapid reduction of idiosyncratic risk for newly public firms. Heightened transparency empowers firms to manage both internal and external stakeholders effectively, yielding substantial advantages in risk mitigation and reputation management (Montecchi et al., 2021). Internally, supply chain transparency enhances visibility among stakeholders, particularly post-IPO, enabling firms to minimize risk exposure and enhance operational efficiency by coordinating global supply chains and developing proactive strategies to mitigate disruptions (Sodhi & Tang, 2019). Externally, transparency facilitates effective stakeholder management, bolstering consumer

trust through comparative product information and crowd-sourced supplier monitoring (Gardner et al., 2019). By leveraging transparency as a marketing tool, newly public firms can enhance consumer trust, boost revenues, and ensure compliance with environmental and social standards (Kraft & Zheng, 2021).

Furthermore, our analysis posits an inverted U-shaped relationship between supply chain transparency and idiosyncratic risk post-IPO. Initially, the detrimental effects may outweigh benefits, increasing idiosyncratic risk. However, as transparency exceeds a moderate threshold, benefits surpass detriments, leading to reduced idiosyncratic risk (Fischer & Pollock, 2004; Garg et al., 2019). This nuanced understanding challenges conventional linear interpretations, emphasizing the need for tailored transparency strategies aligned with firms' unique financial contours (Montecchi et al., 2021). Overall, our study enriches supply chain literature by reconciling opposing effects of transparency, spotlighting the pivotal role of strategic adaptation in navigating post-IPO challenges and opportunities.

Taken together, considering that the detrimental effects of supply chain transparency increase at a decreasing rate and the beneficial effects tend to increase at an increasing rate, we posit that these two opposing forces create an inverted U-shaped relationship between a newly public firm's idiosyncratic risk and its supply chain transparency during the initial stage after IPOs. As supply chain transparency increases moderately, the detrimental effects may initially outweigh the benefits, resulting in an overall negative net effect on the firm's idiosyncratic risk, i.e., an increase in firm idiosyncratic risk. However, once supply chain transparency exceeds this moderate level, the benefits of transparency significantly outweigh the detrimental effects, leading to an overall positive effect on idiosyncratic risk reduction, i.e., a decrease in idiosyncratic risk. We hypothesize:

***Hypothesis 1:*** *The relationship between supply chain transparency and idiosyncratic risk is characterized by an inverted U-shaped curve, reflecting the interplay of diminishing detrimental effects and accelerating beneficial effects as transparency increases.*

### 2.3 The moderating effects of firm digitalization

The advantages and drawbacks of supply chain transparency become more pronounced at higher levels of a firm's digitalization, contributing to an intensified inverted U-shaped relationship. Firm digitalization refers to the strategic incorporation of digital technologies into all facets of a business's operations. This holistic transformation process involves integrating digital solutions to revamp internal processes, enhance customer interactions, and evolve business models for optimized performance and competitive advantage (Gradillas & Thomas, 2023; Ritter & Pedersen, 2020).

In the context of highly digitized firms, particularly those newly public, the pursuit of transparent supply chains can elevate ancillary costs and systemic risks. A nuanced application of stakeholder theory is imperative to balance the diverse interests of stakeholders (Bridoux & Stoelhorst, 2022). Significant investments in technologies like IoT, AI, and blockchain, while enhancing transparency, also heighten vulnerabilities, as seen in cyberattacks like Maersk's (Sundaram et al., 2020). RFID technology, adopted by Target, boosts transparency but incurs substantial maintenance and implementation costs, necessitating careful evaluation within stakeholder theory (Parmar et al., 2010).

The complexities of digital systems administration amplify risks to stakeholder autonomy and data governance (van Houwelingen & Stoelhorst, 2023). Relying on third-party vendors for specialized digital technologies introduces the risk of vendor lock-in and data sovereignty erosion (Kane, 2016). Maintaining a robust digital infrastructure requires continuous upgrades, posing challenges, particularly for smaller enterprises (Li, 2020). Digitization may inadvertently expose proprietary strategies or supply chain vulnerabilities due to increased data

accessibility (Ritter & Pedersen, 2020). Enhanced transparency can compromise a firm's competitive edge and constrain its ability to mitigate supply chain anomalies.

Digitalization can significantly enhance transparency, aligning with stakeholder theory by balancing diverse interests. Real-time tracking and tracing aid in disruption mitigation and supplier performance improvement (Gradillas & Thomas, 2023; Ritter & Pedersen, 2020). Cloud computing platforms, like Zara's, adapt inventory systems to meet market demands, aligning with stakeholder expectations (Nadkarni & Prügl, 2021). FedEx's use of AI and machine learning optimizes operations and fosters transparency and trust (Hanelt et al., 2021).

Enhanced communication with internal stakeholders fosters trust and mitigates reputational damage (Mubarak & Petraite, 2020). Implementing IoT, AI, and blockchain technologies escalates transparency-related benefits, particularly in risk management (Rodríguez-Espíndola et al., 2020). The TradeLens platform simplifies global trade processes, benefiting various stakeholders (IBM & Maersk). Real-time tracking and automated data collection reduce risks associated with delays or damage (Rodríguez-Espíndola et al., 2020). Predictive analytics mitigate risks, aligning with stakeholder interests in stability and reliability.

Digitalization promotes supply chain integration, fostering collaboration and resilience and supporting stakeholder theory by acknowledging the integral role of all parties (Rodríguez-Espíndola et al., 2020).

Collectively, the drawbacks and advantages of supply chain transparency are amplified when a newly public firm undergoes a higher degree of firm digitalization. This heightened digitalization accentuates the inverted U-shaped relationship between supply chain transparency and idiosyncratic risk, making the curve more pronounced.

***Hypothesis 2****: The inverted U-shaped relationship between supply chain transparency and a newly public firm's idiosyncratic risk is intensified (more steepened slopes at both sides of the curve) when newly public firms present a high level of firm digitalization.*

# 3. Data and Methodology

## 3.1 Sample and data collection

The sample frame was derived from all Initial Public Offerings (IPOs) on China's Growth Enterprise Board, known as ChiNext, a favored sample in existing scholarship exploring entrepreneurial firms within the Chinese context (Wang & Song, 2016; Zhang et al., 2022). ChiNext, established by the Shenzhen Stock Exchange in 2009, represents a dynamic and innovative segment of the Chinese equity market specifically designed to support the growth of entrepreneurial firms. This market segment is characterized by its unique regulatory environment and the high-growth potential of its listed companies, aligning with our investigation into the effects of supply chain transparency on idiosyncratic risk in newly public firms.

There are compelling reasons for selecting this subset of the Chinese market. First, the regulatory framework for ChiNext-listed companies mandates extensive disclosure of supply chain information, including significant supplier data (Wang et al., 2023). This regulatory demand provides a rich dataset conducive to our research, enabling an in-depth examination of supply chain practices among these firms. Moreover, ChiNext is relevant for studying firms transitioning from private to public status. These firms face heightened scrutiny upon listing, incentivizing transparent practices, making ChiNext optimal for our study.

The initial five-year post-IPO period on ChiNext is critical for firms adapting to the public market's demands. Strategic and operational changes, especially in supply chain management and digitalization, are significant for assessing transparency's impact on idiosyncratic risk. Lastly, stringent disclosure requirements provide comprehensive data, facilitating accurate assessments of transparency and risk management practices. This setting offers insights into how digitalization meets regulatory and market expectations. By focusing on ChiNext-listed companies, our research leverages a context uniquely informative for understanding transparency and risk dynamics in early public life. The distinct regulatory environment and

evolutionary stage of these companies provide a rich empirical setting for exploring our research question with depth and specificity.

To rigorously examine our proposed hypotheses, we utilized two primary data sources: the China Stock Market and Accounting Research (CSMAR) database and the annual reports of the respective corporations. The CSMAR database, a leading data provider for scholarly discourse in China, offers governance and fiscal data for all publicly listed Chinese firms (Wang et al., 2023). Corporate annual reports provide valuable insights into enterprise strategies and business circumstances (Zeng et al., 2022). In contemporary research on topics like firm digitalization (e.g., Chen et al., 2023) and supply chain transparency (e.g., Chen et al., 2019; Wang et al., 2023), annual reports are recognized as the primary data source.

Our sample includes IPOs launched from 2009 to 2016, with each firm in the sample observed post-IPO for a period of 5 years, concluding our data coverage in 2021. Out of the original 571 identified newly public firms, 42 were omitted due to indications of Particular Transfer or Special Treatment. These indications suggest consecutive negative profits for two to three years, accompanied by inconsistent financial reporting. Consequently, our final sample comprised 2645 observations extracted from 529 firms, spanning 28 provinces and 13 industries. Within our sample, 71.08% represent the manufacturing industry, and 79.58% have their corporate headquarters situated in the eastern coastal region of China.

### 3.2 Measures

#### *3.2.1 Dependent variable*

Idiosyncratic risk pertains to the variation in stock returns attributable to firm-specific factors rather than systematic risk factors. Consistent with the approach adopted by Li et al. (2021), we quantify a company's idiosyncratic risk using stock-response models, specifically applying the Carhart four-factor model (FF4). Introduced by Carhart (1997), the FF4 model extends the Fama and French three-factor model (1993) by introducing an additional momentum factor.

This augmented model provides a more comprehensive analysis of the factors influencing market dynamics. The ensuing equation is estimated as follows:

$$RS\_RF_{im} = \alpha + \beta_{iRM\_RF}RM\_RF_m + \beta_{iHML}HML_m + \beta_{iSMB}SMB_m + \beta_{iUMD}UMD_m + \varepsilon_{im}.$$

In this formula, $RS\_RF_{im}$ represents the excess stock return over the risk-free interest rate (analogous to the monthly version of the announced three-month fixed deposit benchmark interest rate by the central bank) for company $i$ in month $m$. The notation $RM\_RF_m$ symbolizes the excess market returns, which is the value-weighted return on all ChiNext-listed stocks, subtracting the risk-free interest rate for month m. $HML_m$ is a risk premium factor anchored in the book-to-market value, signifying the variance in returns between stocks with high and low book-to-market ratios within a designated month $m$. Correspondingly, $SMB_m$ is the risk premium factor contingent on size, characterized as the divergence between the return on a value-weighted portfolio of small stocks and large stocks during the identical month m. The notation $UMD_m$ encapsulates the momentum factor, determined as the disparity between the average returns of two portfolios with historically high and low yields in the same month m. Lastly, $\varepsilon_{im}$ is the residual term for firm i during month m. The idiosyncratic risk for each firm is assessed via the annualized standard deviation of this residual $\varepsilon_{im}$, denoted as $\mathrm{IR}_{it}$ for firm i during year t in our investigation. Referring to Li et al. (2021)'s study, we employ the idiosyncratic risk value sourced from the t+1 period for our analysis.

$$\mathrm{IR}_{it} = \left[\frac{1}{12}\sum_{m=1}^{12}(\varepsilon_{im} - \varepsilon_{it})^2\right]^{\frac{1}{2}}$$

### *3.2.2 Independent variable*

Building on previous research (Chen et al., 2019; Wang et al., 2023), we employ the level of disclosure in the supplier list to gauge supply chain transparency (SCT). Specifically, Chinese authorities encourage publicly listed companies to divulge essential supplier information in their annual reports, including the identities of their five largest suppliers. Our observation

focuses on the supplier information disclosed in each company's annual report. In cases where a company either refrains from disclosing supplier information or provides only anonymous representations of supplier identities (e.g., Supplier A or Supplier 1), we categorize such instances as undisclosed. Following the measurement method outlined by Wang et al. (2023), we quantify SCT by dividing the number of disclosed supplier identities by 5. A higher ratio indicates a greater level of supply chain transparency for the enterprise.

### *3.2.3 Moderating variable*

Drawing from the methodologies outlined by Chen et al. (2023) and Zeng et al. (2022), this study employs text mining methods to extract information related to digital keywords from the Management Discussions and Analysis (MD&A) sections of corporate annual reports. From this extraction, we construct a corporate firm digitalization index. Annual reports serve as a reflection of a company's current business conditions and strategies. The MD&A section, a crucial source of unstructured qualitative data within annual reports, provides a subjective evaluation of the company's performance in the past year and its prospects for the coming year. Executives carefully express their views in this section to ensure the validity and robustness of the disclosed information (Huang et al., 2022). Hence, existing research on digitalization often analyzes information from the MD&A section to investigate digital actions related to the supply chain (Wang & Bai, 2021).

Following the approach of Zhao et al. (2021), we construct the corporate digitalization index by utilizing digital transformation policy documents and annual reports of listed companies. This index encompasses 99 digital-related keywords, categorized into four aspects: digital technology applications, internet business models, smart manufacturing, and contemporary information systems. Subsequently, we conduct text analysis on relevant phrases within the MD&A sections of the sample companies' annual reports. We augment the digital words to the "jieba" word list in the Python package and employ machine learning techniques to analyze the

MD&A sections. The estimation of the usage frequency of the 99 digital words in the annual reports follows the methodology outlined by Chen et al. (2023). We use the total word frequency of all digital keywords as a proxy variable for corporate firm digitalization. Additionally, in the robustness test section, we calculate the degree of firm digitalization for each company by determining the ratio of the total word frequency of digital keywords to the length of the MD&A section.

### *3.2.4 Control Variables*

We incorporate various variables at the firm, individual, team, and industry levels that could potentially correlate with idiosyncratic risk in recently public firms. In terms of firm characteristics, we consider the logarithm of total employees to measure firm size, reflecting the potential risk reduction associated with larger firms due to diversified portfolios. Firm age, quantified as the number of years since the company's inception, undergoes a logarithmic transformation and standardization for distribution normalization. High-tech firms, identified by the High and New Technology Enterprise certification, are included due to their unique risk profile. Government affiliation, measured as a binary variable indicating the largest shareholder's status (government institution or state-owned enterprise), is considered for its potential stabilizing effect. Supply chain concentration, represented by the proportion of purchases from the top five suppliers, is controlled for the risk of over-dependence. Auditor quality is included as a binary variable, reflecting the affiliation with the top 10 domestic Chinese accounting firms.

Multiple financial indicators at the firm level are incorporated to manage potential influences on idiosyncratic risk. Research and development (R&D) intensity, calculated as R&D expenditures to total sales, is considered for its association with innovation-related risk. Financial leverage, the ratio of long-term debt to the market value of common stock, is included to account for the risk of fixed debt payments. Sales growth, the growth rate in sales revenue

over the previous year, is considered for its potential operational complexities and competition. The book-to-market ratio, reflecting growth potential and stock return fluctuations, is included. The fixed asset ratio, the proportion of net fixed assets to total assets, is considered for its impact on liquidity and maintenance costs. Intangible assets, the ratio of net intangible assets to total assets, are controlled for their context-dependent value. Operational cash ratio, the ratio of current liabilities to operational cash flows, is included due to its correlation with stock return volatility. Profit volatility, measured as the standard deviation of the quarterly profit margin, is considered for its potential impact on risk. Return-on-Assets (ROA), the ratio of income before extraordinary items to total gross assets, is included. The quick ratio, calculated as the difference between current assets and inventory divided by current liabilities, reflects short-term financial robustness. The annual stock return, indicating the firm's financial well-being, is considered for its potential influence on idiosyncratic risk.

Various controls at the individual, team, and industry levels are also considered for their potential impact on a newly public firm's idiosyncratic risk. At the individual level, CEO duality, board directorships, and CEO succession are controlled for using binary variables. At the team level, the total number of top management team (TMT) members is considered. Executive equity, represented by the percentage of stock options granted to executives, is controlled for. Board independence, quantified as the ratio of external directors to total directors, is included. At the industry level, controls for industry ROA and quick ratio are introduced, calculated as the average ROA and quick ratio of firms within a specific industry based on the 2012 China Securities Regulatory Commission (CSRC) industry classification.

### 3.3. Descriptive Statistics

Table 1 presents descriptive statistics for all variables. The mean value for supply chain transparency (SCT) is 0.258, accompanied by a standard deviation of 0.407. Idiosyncratic risk (IR) and firm digitalization (FD) have mean values of 0.11 and 27.905, respectively. The

correlation matrix in Table 2 reveals coefficients mostly below 0.6. To address potential multicollinearity, we mean-centered the variables before creating interaction terms. Subsequently, we computed variance inflation factors (VIFs) in the analysis's later stages. Our observations indicate that all VIFs are below 5, averaging at 1.53. This falls well below the widely recognized threshold of 10 (Neter et al., 1990). Hence, post-regression assessments suggest that multicollinearity poses no significant obstacle in the current study's context.

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Insert Table 1 about here.
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### 3.4. Model Specifications

Due to the panel-data structure of our sample, we conducted the Hausman test, which yielded a preference for fixed effects over random effects (p=0.000). Acknowledging that the typical ordinary least squares estimator using fixed effects may encompass diverse sources of unobserved heterogeneity, we adopted the high-dimensional fixed effects (HDFE) estimator, as proposed by Correia (2019). Implementation of the "reghdfe" command in Stata enabled us to control for various tiers of fixed effects, including firm, industry, the year of the firm's initial public offering (IPO year), post-IPO years, and whether the firm received financial institution backing before going public (financial backing). This approach effectively addresses multisource heterogeneity and non-nested clustered standard errors (Guimarães & Portugal, 2010) and is widely employed by researchers in strategy-related fields (e.g., Timonina-Farkas et al., 2020).

## 4. Analysis and Results

Table 2 presents the regression results examining the influence of supply chain transparency (SCT) on idiosyncratic risk (IR) and the moderating roles of firm digitalization (FD). The table is structured as follows: Models 1 and 2 showcase the test results related to Hypothesis 1 (H1), while Models 3 delineate the findings associated with Hypothesis 2 (H2). Robust standard errors clustered at the firm level are reported in parentheses.

### 4.1. Impact of SCT on IR

The baseline model for idiosyncratic risk (IR), labeled as Model 1 in Table 2, includes only moderating and control variables. Interestingly, our results suggest that firm digitalization (FD) might elevate IR; however, this influence is not statistically significant in Model 1 ($p > 0.1$). This observation aligns with the understanding that while digital transformation is resource-intensive and entails risks, it also has the potential to automate mundane tasks, improve operational processes, and enhance supply chain efficiency (Zheng et al., 2023). Consequently, Firm digitalization could potentially mitigate IR. The escalation effect of firm digitalization on IR, resulting from complex implementation, may be counterbalanced by its risk-reducing effect through efficiency augmentation.

Hypothesis 1 proposes an inverse U-shaped relationship between a newly public firm's supply chain transparency (SCT) and its IR. As confirmed by Model 2, the SCT coefficient is positive and statistically significant ($\beta_{SCT}$= 0.0713, $p$< 0.001), indicating an increase in idiosyncratic risk with enhanced SCT. The coefficients for the square of SCT are negative and statistically significant ($\beta_{SCT}^2$ = -0.1029, $p$ < 0.001), indicating a positive linear term combined with a negative quadratic term. To accurately interpret this inverted U-shaped relationship, we follow the recommendations of Haans et al. (2016) and Lind and Mehlum (2010) to identify the inflection point and calculate confidence intervals based on Fieller's standard error. The estimated inflection point of SCT is 0.347 within the 95% confidence interval of [0.235, 0.413], falling within the data range (from 0 to 1.6). Consequently, an increase in SCT will enhance IR as long as SCT does not surpass 0.347; beyond this point, an increase in SCT will lead to a decline in IR. These tests robustly validate the inverted U-shaped correlation, endorsing Hypothesis 1. We further illustrate this correlation between SCT and IR in an inverted U-shaped graph (see Figure 1), utilizing the descriptive statistics of SCT from Table 1 and the determined

coefficients of SCT and SCT squared from Model 2 in Table 2. The graph depicts an initial rise followed by a decrease in IR as SCT escalates.

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Insert Table 2 and Figure 1 about here.

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**4.2. Moderating Role of Firm Digitalization**

Hypothesis 2 suggests that firm digitalization (FD) can accentuate the inverse U-shaped link between supply chain transparency (SCT) and idiosyncratic risk (IR) for newly public firms. As demonstrated in Model 3, the SCT coefficient is positive and statistically significant ($\beta_{SCT}$= 0.0448, $p$< 0.005); the coefficients for the square of SCT are negative and statistically significant ($\beta_{SCT^2}$= -0.0784, $p$< 0.001), which verifies the presence of the original inverse U-shaped curve. The coefficient of SCT, the interaction term associating SCT and firm digitalization, is identified as positive and statistically significant ($\beta_{SCT*FD}$= 0.0017, $p$< 0.01), while the interaction term involving the square of SCT and firm digitalization is observed to be negative and statistically significant ($\beta_{SCT^2*FD}$=-0.0017, $p$< 0.01). Thus, Hypothesis 2 is strongly supported. Referring to Haans et al. (2016) and Jia et al. (2023), since $\beta_{SCT}$ $\beta_{SCT^2*FD}$ − $\beta_{SCT^2}$ $\beta_{SCT*FD}$ > 0, the turning point of this curve moves to the right as FD increases and $\beta_{SCT^2*FD}$< 0 signifies that a steepness occurs for our inverse U-shaped relationship. Additionally, building on the research of Kleinert (2023), we present the marginal effects of SCT on the IR of newly public firms at different firm digitalization levels (i.e., minimum value, mean value, 1 and 1.5 standard deviations above) and outline the effect sizes in Figure 2. The plot reveals that as firm digitalization increases, the inverted U-shaped relationship becomes steeper, validating the intensifying moderating effect of firm digitalization. Therefore, the figure further strengthens the moderating effect proposed in Hypothesis 2.

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Insert Figure 2 about here.

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**4.3. Robustness**

To validate the robustness of our findings, we reproduce the analysis using the firm digitalization (FD) ratio, estimated by the ratio of the total word frequency of digital keywords to the length of the Management's MD&A section, following the methodology of Lu et al. (2023). The results, as presented in Table 3, align with our primary analysis. In Model 2, the computed coefficient of SCT is positive and statistically significant ($\beta_{SCT}$= 0.0699, $p < 0.001$). The calculated coefficients of SCT squared are negative and significant ($\beta_{SCT^2}$= -0.1017, $p < 0.001$), indicating a positive linear term and a negative quadratic term. In Model 3, the interaction term between SCT and the FD ratio is positive and significant ($\beta_{SCT*FD\ ratio}$= 0.0027, $p < 0.001$), while the interaction term between SCT squared and the firm digitalization ratio is negative and significant ($\beta_{SCT^2*FD\ ratio}$ = -0.0026, $p < 0.001$). Referring to Haans et al. (2016), since $\beta_{SCT}\ \beta_{SCT^2*FD\ ratio} - \beta_{SCT^2}\ \beta_{SCT*FD\ ratio} > 0$, the turning point of this curve moves to the right as FD increases and $\beta_{SCT^2*FD\ ratio} < 0$ signifies that a steepness occurs for our inverse U-shaped relationship. In Figure 3, we illustrate the marginal effects of SCT on the idiosyncratic risk (IR) of newly listed firms at varying firm digitalization ratio levels. The graphical representation demonstrates that with an increase in the firm digitalization ratio, the inverted U-shaped relationship becomes steeper, thus affirming the escalating moderating effect of the firm digitalization ratio.

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Insert Table 3 and Figure 3 about here.
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**4.4. Additional Test**

The Initial Public Offering (IPO) marks a pivotal event in the life cycle of a corporation, and existing literature suggests that a firm's operational strategy undergoes certain adjustments in the immediate aftermath of an IPO (Garg et al., 2019). Consequently, we conducted an additional test to explore whether the post-IPO year could enhance the inverse U-shaped relationship between SCT and IR for newly public firms. As outlined in Table 4, the findings are consistent with our primary hypothesis. In Model 2, the interaction term between SCT and

the post-IPO year appears as positive and significant ($\beta_{SCT*post\text{-}IPO} = 0.0319$, $p < 0.01$), while the interaction term between SCT squared and the post-IPO year is negative and significant ($\beta_{SCT^2*post\text{-}IPO} = -0.0307$, $p < 0.01$). Referring to Haans et al. (2016), since $\beta_{SCT}\,\beta_{SCT^2*post\text{-}IPO} - \beta_{SCT^2}\,\beta_{SCT*post\text{-}IPO} > 0$, the turning point of this curve moves to the right as post-IPO year increases and $\beta_{SCT^2*post\text{-}IPO} < 0$ signifies that a steepness occurs for our inverse U-shaped relationship. Figure 4 visually conveys the marginal effects of SCT on the IR of newly public firms at different levels of the post-IPO year. The illustration reveals that as the post-IPO year increases, the inverse U-shaped relationship becomes steeper, thereby validating the intensifying moderating effect of the post-IPO year.

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Insert Table 4 and Figure 4 about here.

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## 5. Discussion

### 5.1 Theoretical implications

This study makes significant contributions to existing literature across several dimensions. Firstly, it establishes and validates an inverted U-shaped relationship between supply chain transparency and its effects, departing from prior linear interpretations and filling a research void (Sodhi & Tang, 2019; Montecchi et al., 2021). By integrating both favorable and unfavorable aspects of transparency, our work emphasizes the need for a nuanced approach to operational strategies, driving continued scholarly exploration.

Secondly, our research pioneers the examination of the intricate interplay between supply chain transparency and company-specific idiosyncratic risk, broadening the scope of supply chain risk analysis (Sodhi & Tang, 2019; Sunny et al., 2020). This shift emphasizes the importance of idiosyncratic risk assessment, which is crucial for shareholder value, especially for newly public companies navigating post-IPO challenges (Montecchi et al., 2021).

Thirdly, our study delves into the role of digitalization in shaping the relationship between supply chain transparency and idiosyncratic risk, offering a nuanced understanding of these interdependencies (Koh et al., 2019; Chen et al., 2021). By revealing an inverted U-shaped relationship influenced by digital maturity, our insights expand the academic conversation, urging future research to explore how different digital facets interact with transparency to mitigate or exacerbate idiosyncratic risk (Lorenz et al., 2020).

Additionally, our focus on the formative period post-IPO enriches the literature by spotlighting the distinctive challenges and strategies relevant to newly public entities, diverging from the predominant focus on established enterprises (Sodhi & Tang, 2019). This research illuminates how supply chain transparency's influence fluctuates across a firm's life cycle, offering insights crucial for sustainable growth.

Finally, our study contributes to stakeholder theory by revealing a non-linear relationship between supply chain transparency and idiosyncratic risk, emphasizing the need for a nuanced understanding of transparency dynamics (Morgan et al., 2023). By demonstrating the existence of an optimal level of transparency aligned with stakeholder interests, our findings underscore the complexity of transparency's impact, calling for a reevaluation within stakeholder theory of how transparency should be pursued to minimize idiosyncratic risk.

**5.2 Managerial implications**

The study offers refined managerial implications, particularly addressing the complexities encountered by firms in their post-IPO stage. Firstly, managers must tailor their transparency approach to match the organization's specific risk profile. A one-size-fits-all model is inadequate; instead, a nuanced, risk-informed transparency strategy must be crafted. This strategy should be underpinned by rigorous risk assessment methodologies, considering prevailing market and regulatory conditions while anticipating potential future disruptions. Leveraging sophisticated data analytics to calibrate transparency efforts ensures alignment with the firm's risk appetite and market dynamics. Establishing a flexible transparency policy that responds to fluid risk factors is crucial, supported by a dedicated governance structure like a transparency oversight team to coordinate strategies across business units.

Secondly, the strategic adoption of digital technologies is pivotal. Managers must selectively integrate technologies like blockchain, providing a secure and immutable ledger for supply chain operations, and AI, analyzing large datasets to uncover actionable insights and identify hidden risks. These technologies should be part of a broader digital transformation strategy, ensuring seamless integration with current processes. This necessitates a commitment to upskilling employees, maintaining robust cybersecurity measures, and establishing a digital task force to evaluate technology deployments continuously.

Thirdly, navigating the post-IPO landscape requires a transparency strategy attuned to increased scrutiny from investors and regulators. Constructing a narrative that communicates the firm's transparency journey to stakeholders in an engaging and informative manner is essential. This involves creating a tiered approach to information disclosure that meets regulatory mandates while preserving strategic business interests. Preparing the management team to adeptly handle investor queries and concerns through simulated exercises ensures a confident and informed response to transparency and risk discussions.

Fourthly, transparency in stakeholder engagement goes beyond regulatory compliance; it is a strategic tool for building enduring trust and demonstrating a commitment to responsible supply chain management. Initiatives should involve stakeholders in dialogue and decision-making processes, integrating their feedback into corporate strategies to align transparency efforts with societal values and long-term sustainability.

By integrating these enriched strategies into their operations, managers can effectively leverage supply chain transparency as a strategic asset. This asset not only mitigates risk but also aligns with stakeholder expectations, positioning the firm for sustained success in the public domain.

## 6. Conclusion, Limitations, and Future Research Directions

This study illuminates the intricate dynamics among supply chain transparency, digitalization, and idiosyncratic risk in the context of newly public firms. Our results unveil a nuanced inverted U-shaped relationship between transparency and risk, emphasizing an optimal transparency level for effective risk mitigation. Notably, we ascertain that digitalization enhances this effect, underscoring its pivotal role in shaping robust supply chain and risk management strategies. These findings challenge traditional linear models and provide a groundbreaking perspective on the financial implications of transparency, particularly within the post-IPO landscape of firms.

This study provides valuable insights while acknowledging certain limitations, thereby suggesting avenues for future research. Firstly, it uncovers an inverted U-shaped relationship between supply chain transparency and idiosyncratic risk, prompting further exploration into the underlying mechanisms governing these contrasting effects. Detailed case analyses or longitudinal studies could contribute to understanding the evolution of this relationship and identifying potential mediating factors.

Secondly, the study recognizes firm digitalization as a crucial boundary condition, given the prevalent use of digital technologies. However, there remains room for future research to investigate additional conditions influencing the transparency-risk relationship. These may include the adoption of disruptive technologies, market volatility, or the regulatory environment. Examining the interplay between different conditions, such as digitalization and firm size, also deserves attention.

Lastly, while the study focuses on the newly public stages of an IPO firm, future research could extend its scope to encompass other lifecycle stages, such as the seasoned or pre-IPO stages. Conducting longitudinal studies that observe firms from their pre-IPO stage through to their seasoned stages could unveil shifts in transparency strategies and risk levels. This approach would offer valuable insights into managing transparency and risk across various lifecycle stages, providing a more comprehensive understanding of these dynamics.

**Table 1. Correlation Matrix**

| Variables | Mean | SD | (1) | (2) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Idiosyncratic risk | 0.110 | 0.061 | 1 | | | | | | | | | |
| (2) Supply chain transparency | 0.258 | 0.407 | -0.116*** | 1 | | | | | | | | |
| (3) Firm digitalization | 27.905 | 43.595 | 0.061*** | -0.042** | 1 | | | | | | | |
| (4) Firm age | 14.217 | 4.853 | 0.011 | 0.018 | 0.126*** | 1 | | | | | | |
| (5) Firm size | 2.971 | 0.362 | -0.013 | -0.041** | 0.135*** | 0.098*** | 1 | | | | | |
| (6) R&D intensity | 7.598 | 7.380 | 0.094*** | -0.033* | 0.206*** | -0.047** | -0.077*** | 1 | | | | |
| (7) ROA | 0.047 | 0.069 | -0.082*** | -0.071*** | -0.028 | -0.002 | 0.054*** | -0.071*** | 1 | | | |
| (8) Financial leverage | 0.286 | 0.169 | 0.049** | -0.017 | 0.043** | 0.156*** | 0.336*** | -0.236*** | -0.283*** | 1 | | |
| (9) Sales growth | 0.282 | 0.596 | -0.001 | -0.009 | 0.059*** | -0.026 | 0.133*** | -0.103*** | 0.124*** | 0.147*** | 1 | |
| (10) Book to market | 0.349 | 0.164 | -0.034* | 0.059*** | -0.116*** | -0.207*** | -0.128*** | -0.013 | -0.042** | -0.432*** | -0.083*** | 1 |
| (11) Executive equity | 0.177 | 0.184 | 0.014 | -0.053*** | 0.029 | -0.025 | -0.092*** | 0.056*** | 0.054*** | -0.099*** | -0.025 | 0.124*** |
| (12) Government affiliation | 0.087 | 0.281 | -0.054*** | 0.045** | 0.017 | -0.027 | 0.030 | -0.024 | 0.034* | -0.019 | 0.026 | 0.039** |
| (13) Board independence | 3.009 | 0.388 | -0.025 | 0.058*** | 0.019 | -0.002 | 0.078*** | 0.000 | 0.008 | 0.000 | 0.030 | 0.072*** |
| (14) Fixed asset | 0.160 | 0.119 | 0.034* | -0.019 | -0.273*** | 0.047** | 0.127*** | -0.216*** | -0.059*** | 0.072*** | -0.073*** | -0.023 |
| (15) Intangible asset | 0.041 | 0.038 | 0.011 | 0.035* | -0.103*** | 0.007 | 0.046** | 0.049** | -0.078*** | 0.042** | 0.033* | 0.016 |
| (16) Operating cash | 0.391 | 0.228 | -0.052*** | -0.012 | -0.006 | -0.156*** | -0.371*** | 0.219*** | 0.253*** | -0.745*** | -0.147*** | 0.346*** |
| (17) Profits volatility | 0.037 | 0.048 | 0.029 | -0.005 | 0.008 | -0.075*** | -0.114*** | 0.122*** | -0.399*** | -0.039** | -0.084*** | 0.129*** |
| (18) Quick ratio | 3.977 | 5.923 | 0.029 | -0.008 | -0.045** | -0.158*** | -0.287*** | 0.343*** | 0.118*** | -0.521*** | -0.116*** | 0.282*** |
| (19) Annual stock return | 0.256 | 0.741 | 0.130*** | -0.026 | 0.066*** | -0.014 | 0.026 | 0.004 | 0.100*** | 0.024 | 0.125*** | -0.365*** |
| (20) High-tech certification | 0.934 | 0.249 | -0.103*** | -0.058*** | 0.050*** | 0.059*** | -0.047** | 0.134*** | 0.041** | -0.038* | 0.000 | 0.026 |
| (21) CEO succession | 0.100 | 0.300 | 0.010 | 0.042** | -0.022 | 0.002 | -0.030 | -0.005 | -0.041** | 0.039** | 0.066*** | 0.027 |
| (22) CEO duality | 0.385 | 0.487 | -0.023 | 0.007 | -0.022 | -0.046** | 0.015 | 0.036* | -0.008 | -0.001 | -0.003 | 0.036* |
| (23) CEO board directorship | 0.021 | 0.143 | 0.003 | 0.016 | -0.012 | 0.004 | 0.049** | -0.013 | 0.027 | 0.021 | 0.003 | -0.002 |
| (24) TMT size | 5.964 | 1.942 | 0.001 | 0.061*** | 0.069*** | 0.007 | 0.178*** | 0.062*** | 0.034* | 0.053*** | 0.001 | 0.015 |
| (25) Supply chain concentration | 31.234 | 16.418 | 0.047** | -0.018 | -0.022 | 0.083*** | -0.178*** | 0.098*** | -0.055*** | 0.046** | 0.033* | -0.201*** |
| (26) Auditor quality | 0.562 | 0.496 | 0.035* | 0.033* | 0.063*** | 0.081*** | 0.058*** | 0.036* | 0.011 | 0.034* | 0.006 | -0.042** |
| (27) Industry ROA | 0.074 | 0.025 | 0.017 | 0.043** | -0.124*** | -0.303*** | -0.064*** | 0.017 | 0.204*** | -0.280*** | 0.013 | 0.182*** |
| (28) Industry quick ratio | 3.447 | 1.789 | 0.005 | 0.012 | 0.028 | -0.307*** | -0.127*** | 0.116*** | 0.073*** | -0.291*** | -0.018 | 0.348*** |

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

| Variables | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) | (22) | (23) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (11) Executive equity | 1 | | | | | | | | | | | |
| (12) Government affiliation | -0.121*** | 1 | | | | | | | | | | |
| (13) Board independence | 0.013 | 0.052*** | 1 | | | | | | | | | |
| (14) Fixed asset | -0.106*** | -0.086*** | 0.018 | 1 | | | | | | | | |
| (15) Intangible asset | -0.088*** | -0.012 | 0.029 | 0.120*** | 1 | | | | | | | |
| (16) Operating cash | 0.155*** | 0.060*** | -0.019 | -0.402*** | -0.255*** | 1 | | | | | | |
| (17) Profits volatility | 0.059*** | -0.027 | 0.004 | -0.125*** | -0.067*** | 0.124*** | 1 | | | | | |
| (18) Quick ratio | 0.122*** | 0.021 | -0.052*** | -0.167*** | -0.099*** | 0.565*** | 0.151*** | 1 | | | | |
| (19) Annual stock return | -0.013 | -0.045** | -0.021 | 0.028 | 0.027 | -0.064*** | -0.107*** | -0.029 | 1 | | | |
| (20) High-tech certification | 0.004 | -0.075*** | -0.068*** | 0.028 | -0.015 | 0.023 | -0.085*** | -0.014 | -0.022 | 1 | | |
| (21) CEO succession | -0.080*** | 0.000 | 0.008 | -0.016 | 0.049** | -0.030 | 0.017 | -0.021 | -0.017 | -0.018 | 1 | |
| (22) CEO duality | 0.512*** | -0.075*** | 0.014 | 0.003 | -0.041** | -0.012 | 0.023 | 0.062*** | 0.011 | 0.008 | -0.143*** | 1 |
| (23) CEO board directorship | 0.088*** | -0.007 | 0.031 | -0.016 | 0.052*** | -0.062*** | -0.017 | -0.017 | -0.003 | 0.039** | -0.040** | 0.124*** |
| (24) TMT size | 0.054*** | 0.048** | 0.137*** | -0.017 | 0.054*** | -0.041** | -0.037* | -0.031 | -0.009 | 0.048** | -0.017 | 0.026 |
| (25) Supply chain concentration | -0.023 | 0.015 | -0.050** | -0.036* | -0.064*** | -0.015 | 0.058*** | 0.068*** | -0.022 | 0.026 | -0.024 | -0.008 |
| (26) Auditor quality | 0.031 | -0.015 | -0.028 | -0.014 | 0.054*** | -0.028 | -0.009 | -0.029 | 0.022 | -0.045** | 0.013 | 0.026 |
| (27) Industry ROA | 0.092*** | -0.021 | 0.030 | 0.032 | -0.107*** | 0.279*** | -0.036* | 0.199*** | 0.079*** | 0.085*** | 0.005 | 0.041** |
| (28) Industry quick ratio | 0.092*** | -0.001 | 0.052*** | -0.125*** | -0.081*** | 0.349*** | 0.135*** | 0.322*** | -0.063*** | 0.007 | 0.019 | 0.045** |

| Variables | (24) | (25) | (26) | (27) | (28) | (29) |
|---|---|---|---|---|---|---|
| (23) CEO board directorship | 1 | | | | | |
| (24) TMT size | 0.007 | 1 | | | | |
| (25) Supply chain concentration | 0.019 | -0.145*** | 1 | | | |
| (26) Auditor quality | -0.037* | 0.017 | 0.027 | 1 | | |
| (27) Industry ROA | 0.008 | 0.042** | -0.274*** | -0.085*** | 1 | |
| (28) Industry quick ratio | -0.012 | 0.093*** | -0.191*** | -0.044** | 0.392*** | 1 |

**Table 2. Model Estimation Results**

| Variable | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Supply chain transparency* | | 0.0713*** | 0.0448* |
| | | (0.0191) | (0.0215) |
| *Supply chain transparency squared* | | -0.1029*** | -0.0784*** |
| | | (0.0168) | (0.0186) |
| *Supply chain transparency x* | | | 0.0017** |
| *Firm digitalization* | | | (0.0005) |
| *Supply chain transparency squared x* | | | -0.0017** |
| *Firm digitalization* | | | (0.0005) |
| Firm digitalization | 0.0001 | 0.0001 | 0.0001 |
| | (0.0001) | (0.0001) | (0.0001) |
| Firm age | 0.0431+ | 0.0447+ | 0.0440+ |
| | (0.0235) | (0.0230) | (0.0230) |
| Firm size | -0.0362** | -0.0316** | -0.0308** |
| | (0.0113) | (0.0111) | (0.0111) |
| R&D intensity | 0.0013*** | 0.0013*** | 0.0013*** |
| | (0.0004) | (0.0004) | (0.0004) |
| ROA | 0.0231 | 0.0205 | 0.0182 |
| | (0.0263) | (0.0258) | (0.0257) |
| Financial leverage | 0.1118*** | 0.0953*** | 0.0934*** |
| | (0.0238) | (0.0235) | (0.0235) |
| Sales growth | -0.0028 | -0.0035 | -0.0036 |
| | (0.0024) | (0.0023) | (0.0023) |
| Book to market | 0.0838*** | 0.0706*** | 0.0690*** |
| | (0.0143) | (0.0141) | (0.0141) |
| Executive equity | 0.0216 | 0.0223 | 0.0221 |
| | (0.0166) | (0.0162) | (0.0162) |
| Government affiliation | -0.0064 | -0.0088+ | -0.0087 |
| | (0.0054) | (0.0053) | (0.0053) |
| Board independence | -0.0059 | -0.0037 | -0.0038 |
| | (0.0058) | (0.0057) | (0.0057) |
| Fixed asset | 0.1024*** | 0.0939*** | 0.0920*** |
| | (0.0234) | (0.0229) | (0.0229) |
| Intangible asset | 0.0877 | 0.0721 | 0.0680 |
| | (0.0609) | (0.0597) | (0.0596) |
| Operating cash | 0.0329+ | 0.0243 | 0.0232 |
| | (0.0178) | (0.0175) | (0.0176) |
| Profits volatility | 0.0531 | 0.0421 | 0.0406 |
| | (0.0406) | (0.0398) | (0.0397) |

| | | | |
|---|---|---|---|
| Quick ratio | 0.0008+ | 0.0008* | 0.0009* |
| | (0.0004) | (0.0004) | (0.0004) |
| Annual stock return | 0.0078*** | 0.0063** | 0.0060** |
| | (0.0020) | (0.0019) | (0.0019) |
| High-tech certification | -0.0666 | -0.0625 | -0.0681 |
| | (0.0466) | (0.0457) | (0.0456) |
| CEO succession | -0.0019 | -0.0014 | -0.0009 |
| | (0.0044) | (0.0043) | (0.0043) |
| CEO duality | -0.0082 | -0.0071 | -0.0064 |
| | (0.0052) | (0.0051) | (0.0051) |
| CEO board directorship | -0.0059 | -0.0033 | -0.0038 |
| | (0.0133) | (0.0130) | (0.0130) |
| TMT size | 0.0006 | 0.0008 | 0.0008 |
| | (0.0012) | (0.0012) | (0.0011) |
| Supply chain concentration | 0.0002 | 0.0003* | 0.0003* |
| | (0.0001) | (0.0001) | (0.0001) |
| Auditor quality | 0.0062 | 0.0052 | 0.0046 |
| | (0.0043) | (0.0043) | (0.0043) |
| Industry ROA | 0.6409*** | 0.5929*** | 0.5976*** |
| | (0.1092) | (0.1070) | (0.1069) |
| Industry quick ratio | -0.0015 | -0.0016 | -0.0017 |
| | (0.0013) | (0.0013) | (0.0013) |
| Constant | 0.0167 | 0.0102 | 0.0192 |
| | (0.0853) | (0.0842) | (0.0841) |
| F | 5.89*** | 9.00*** | 8.76*** |
| Adjusted R-squared | 0.0805 | 0.1187 | 0.1221 |
| Number of observations | 2645 | 2645 | 2645 |

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001. In all models, idiosyncratic risk value sourced from the t+1 period is the dependent variable. Standard errors in parentheses. Firm, industry, IPO year, post IPO year and financial backing fixed effects are included in all models.

**Table 3. Regression Results for Different Measurements of Firm Digitalization**

| Variable | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| *Supply chain transparency* | | 0.0699*** | 0.0205 |
| | | (0.0190) | (0.0226) |
| *Supply chain transparency squared* | | -0.1017*** | -0.0602** |
| | | (0.0168) | (0.0195) |
| *Supply chain transparency x* | | | 0.0027*** |
| *Firm digitalization ratio* | | | (0.0007) |
| *Supply chain transparency squared x* | | | -0.0026*** |
| *Firm digitalization ratio* | | | (0.0007) |
| Firm digitalization ratio | -0.0002** | -0.0002** | -0.0003*** |
| | (0.0001) | (0.0001) | (0.0001) |
| Firm age | 0.0446+ | 0.0460* | 0.0449+ |
| | (0.0234) | (0.0230) | (0.0229) |
| Firm size | -0.0335** | -0.0291** | -0.0283* |
| | (0.0113) | (0.0111) | (0.0111) |
| R&D intensity | 0.0012** | 0.0012*** | 0.0012*** |
| | (0.0004) | (0.0004) | (0.0004) |
| ROA | 0.0234 | 0.0208 | 0.0169 |
| | (0.0263) | (0.0257) | (0.0256) |
| Financial leverage | 0.1051*** | 0.0889*** | 0.0878*** |
| | (0.0238) | (0.0235) | (0.0234) |
| Sales growth | -0.0026 | -0.0034 | -0.0034 |
| | (0.0024) | (0.0023) | (0.0023) |
| Book to market | 0.0807*** | 0.0675*** | 0.0674*** |
| | (0.0143) | (0.0141) | (0.0141) |
| Executive equity | 0.0209 | 0.0216 | 0.0202 |
| | (0.0165) | (0.0162) | (0.0161) |
| Government affiliation | -0.0058 | -0.0082 | -0.0083 |
| | (0.0054) | (0.0053) | (0.0053) |
| Board independence | -0.0061 | -0.0039 | -0.0038 |
| | (0.0058) | (0.0057) | (0.0057) |
| Fixed asset | 0.0946*** | 0.0866*** | 0.0850*** |
| | (0.0234) | (0.0229) | (0.0229) |
| Intangible asset | 0.0777 | 0.0628 | 0.0615 |
| | (0.0609) | (0.0596) | (0.0594) |
| Operating cash | 0.0261 | 0.0180 | 0.0184 |
| | (0.0179) | (0.0176) | (0.0175) |
| Profits volatility | 0.0546 | 0.0434 | 0.0398 |
| | (0.0405) | (0.0397) | (0.0396) |

| | | | |
|---|---|---|---|
| Quick ratio | 0.0007+ | 0.0007+ | 0.0008* |
| | (0.0004) | (0.0004) | (0.0004) |
| Annual stock return | 0.0077*** | 0.0062** | 0.0060** |
| | (0.0020) | (0.0019) | (0.0019) |
| High-tech certification | -0.0739 | -0.0697 | -0.0529 |
| | (0.0466) | (0.0457) | (0.0458) |
| CEO succession | -0.0017 | -0.0012 | -0.0008 |
| | (0.0044) | (0.0043) | (0.0043) |
| CEO duality | -0.0081 | -0.0070 | -0.0062 |
| | (0.0052) | (0.0051) | (0.0051) |
| CEO board directorship | -0.0063 | -0.0036 | -0.0034 |
| | (0.0132) | (0.0130) | (0.0130) |
| TMT size | 0.0007 | 0.0009 | 0.0008 |
| | (0.0012) | (0.0011) | (0.0011) |
| Supply chain concentration | 0.0002 | 0.0003* | 0.0003* |
| | (0.0001) | (0.0001) | (0.0001) |
| Auditor quality | 0.0063 | 0.0053 | 0.0047 |
| | (0.0043) | (0.0043) | (0.0042) |
| Industry ROA | 0.6327*** | 0.5857*** | 0.5976*** |
| | (0.1089) | (0.1067) | (0.1064) |
| Industry quick ratio | -0.0016 | -0.0017 | -0.0018 |
| | (0.0013) | (0.0013) | (0.0013) |
| Constant | 0.0282 | 0.0215 | 0.0126 |
| | (0.0853) | (0.0841) | (0.0839) |
| F | 6.13*** | 9.21*** | 9.23*** |
| Adjusted R-squared | 0.0831 | 0.1210 | 0.1274 |
| Number of observations | 2645 | 2645 | 2645 |

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001. In all models, idiosyncratic risk value sourced from the t+1 period is the dependent variable. Standard errors in parentheses. Firm, industry, IPO year, post IPO year and financial backing fixed effects are included in all models.

**Table 4. Additional Test**

| Variable | Model 1 | Model 2 |
|---|---|---|
| *Supply chain transparency* | 0.0702*** | -0.0188 |
| | (0.0192) | (0.0334) |
| *Supply chain transparency squared* | -0.1036*** | -0.0182 |
| | (0.0169) | (0.0311) |
| *Supply chain transparency x* | | 0.0319** |
| *Post IPO year* | | (0.0097) |
| *Supply chain transparency squared x* | | -0.0307** |
| *Post IPO year* | | (0.0094) |
| Post IPO year | 0.0046* | 0.0036 |
| | (0.0021) | (0.0022) |
| Firm digitalization | 0.0001 | 0.0001 |
| | (0.0001) | (0.0001) |
| Firm age | 0.0501* | 0.0508* |
| | (0.0232) | (0.0232) |
| Firm size | -0.0306** | -0.0292** |
| | (0.0112) | (0.0112) |
| R&D intensity | 0.0013*** | 0.0013*** |
| | (0.0004) | (0.0004) |
| Financial leverage | 0.0998*** | 0.1010*** |
| | (0.0235) | (0.0234) |
| Sales growth | -0.0032 | -0.0034 |
| | (0.0023) | (0.0023) |
| Book to market | 0.0789*** | 0.0818*** |
| | (0.0137) | (0.0137) |
| Executive equity | 0.0229 | 0.0244 |
| | (0.0163) | (0.0163) |
| Government affiliation | -0.0121* | -0.0119* |
| | (0.0053) | (0.0053) |
| Board independence | -0.0034 | -0.0030 |
| | (0.0058) | (0.0058) |
| Fixed asset | 0.1070*** | 0.1064*** |
| | (0.0229) | (0.0229) |
| Intangible asset | 0.0835 | 0.0837 |
| | (0.0601) | (0.0600) |
| Operating cash | 0.0216 | 0.0196 |
| | (0.0177) | (0.0176) |
| Profits volatility | -0.0175 | -0.0150 |
| | (0.0361) | (0.0360) |

| | | |
|---|---|---|
| Quick ratio | 0.0009* | 0.0010* |
| | (0.0004) | (0.0004) |
| Annual stock return | 0.0078*** | 0.0078*** |
| | (0.0019) | (0.0019) |
| CEO succession | -0.0027 | -0.0021 |
| | (0.0043) | (0.0043) |
| CEO duality | -0.0086+ | -0.0089+ |
| | (0.0052) | (0.0051) |
| CEO board directorship | -0.0049 | -0.0041 |
| | (0.0131) | (0.0131) |
| High-tech certification | -0.0610 | -0.0649 |
| | (0.0460) | (0.0460) |
| TMT size | 0.0011 | 0.0011 |
| | (0.0012) | (0.0012) |
| ROA | -0.0026 | -0.0024 |
| | (0.0255) | (0.0255) |
| Supply chain concentration | 0.0003+ | 0.0003+ |
| | (0.0001) | (0.0001) |
| Auditor quality | 0.0057 | 0.0052 |
| | (0.0043) | (0.0043) |
| Industry ROA | 0.5636*** | 0.5785*** |
| | (0.1076) | (0.1077) |
| Industry quick ratio | -0.0026+ | -0.0025+ |
| | (0.0013) | (0.0013) |
| Constant | -0.0206 | -0.0237 |
| | (0.0812) | (0.0811) |
| F | 10.63*** | 10.33*** |
| Adjusted R-squared | 0.1049 | 0.1087 |
| Number of observations | 2645 | 2645 |

Note: + p<0.1; * p<0.05; ** p<0.01; *** p<0.001. In all models, idiosyncratic risk value sourced from the t+1 period is the dependent variable. Standard errors in parentheses. Firm, industry, IPO year, and financial backing fixed effects are included in all models.

**Figure 1. The Effect of Supply Chain Transparency on Idiosyncratic Risk**

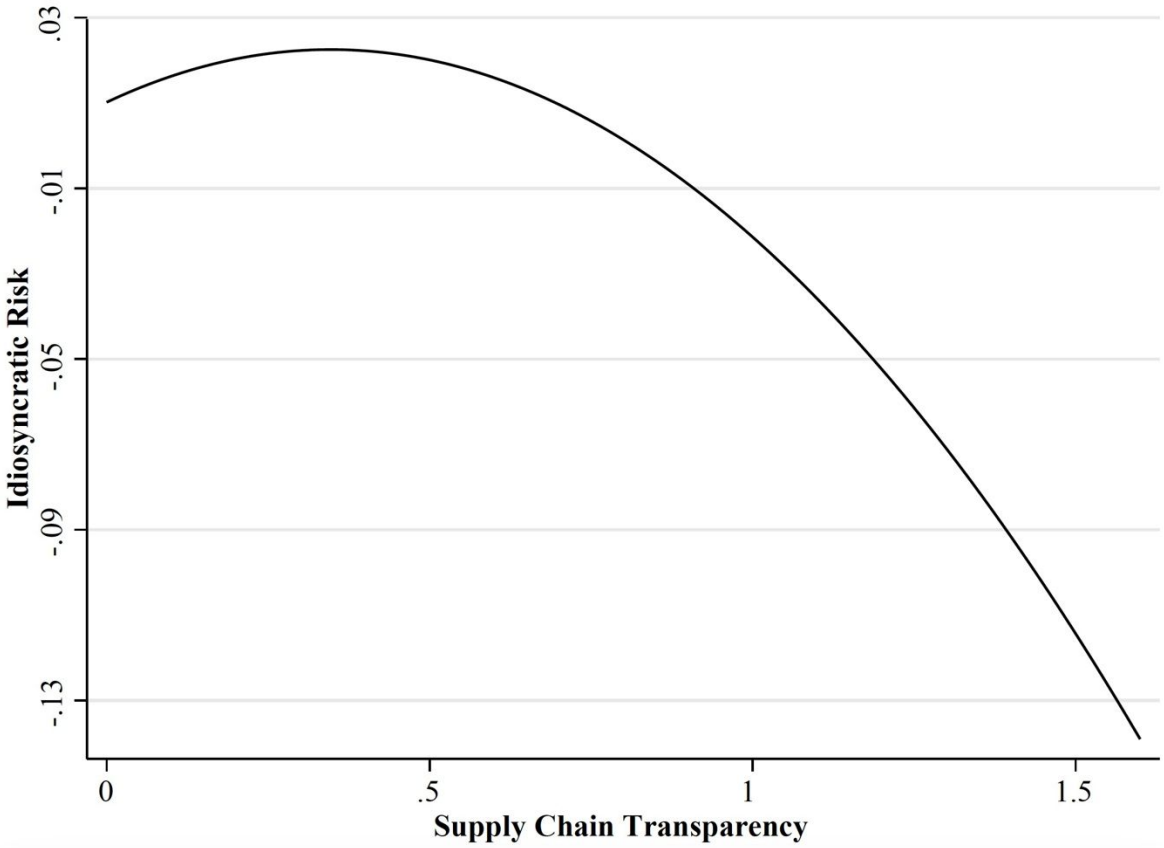


**Figure 2. The Moderating Effect of Firm Digitalization (FD)**

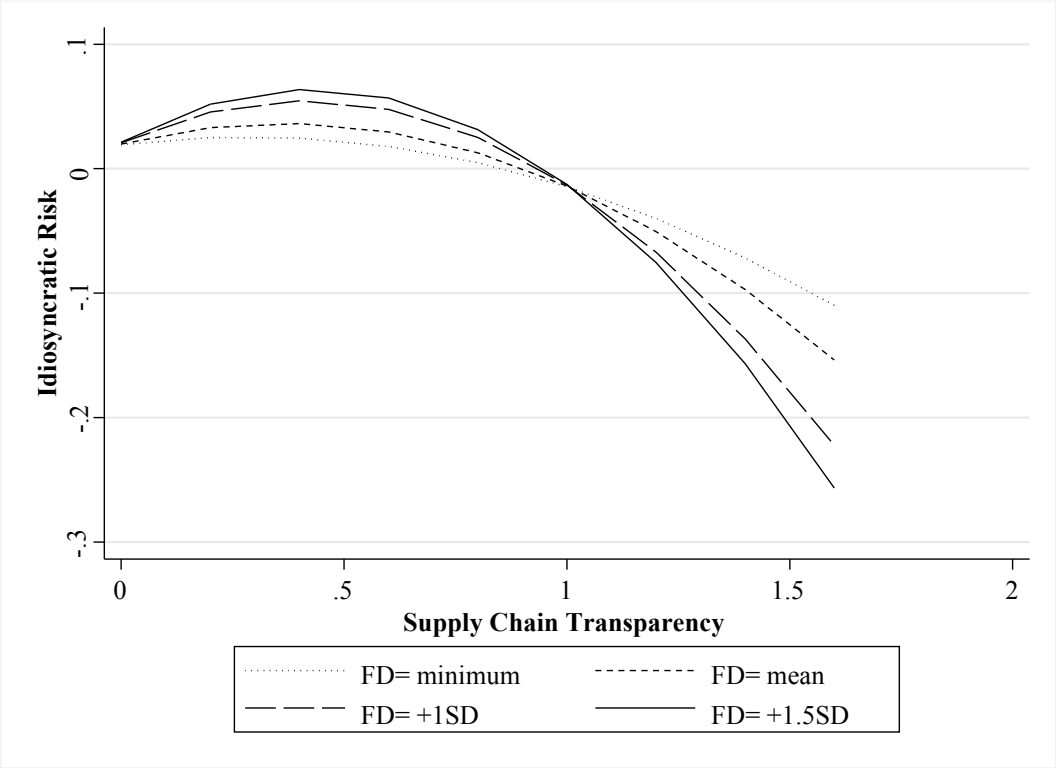


**Figure 3. Regression Results for Different Measurements of Firm Digitalization (FD)**

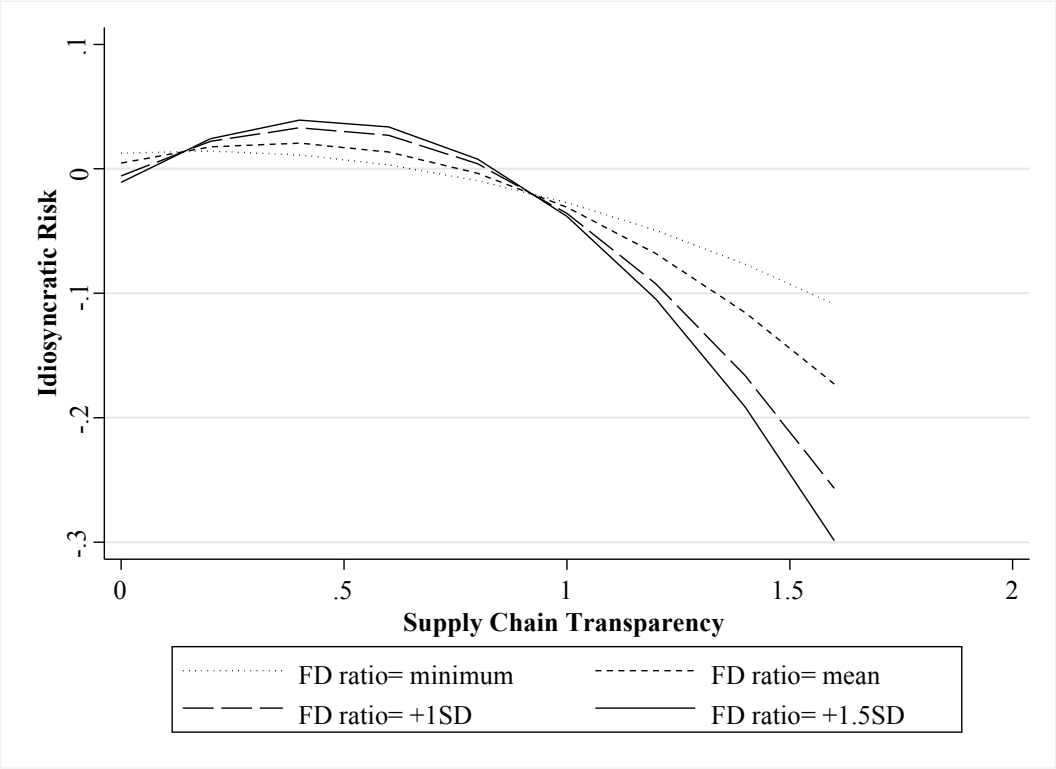
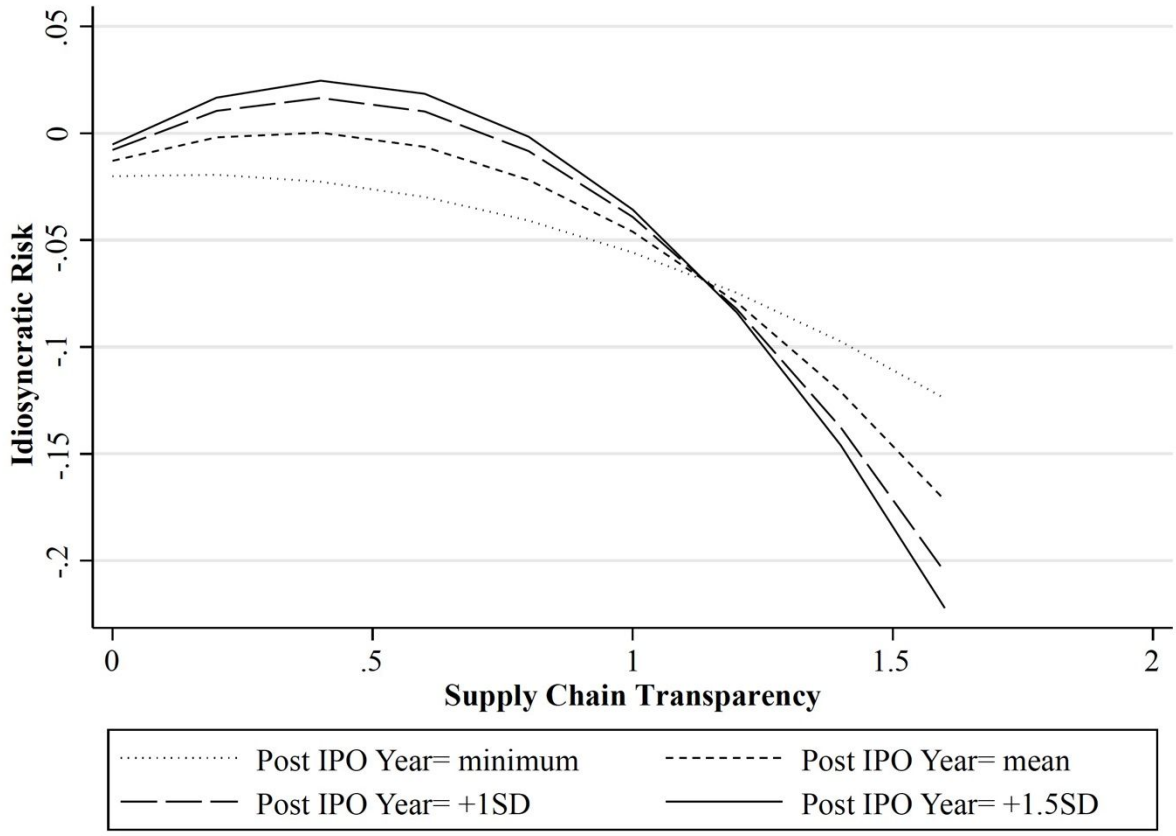


**Figure 4. Additional Test**

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Manuscript ID IJOPM-08-2023-0689.R3

Title: "How Does Supply Chain Transparency Influence Idiosyncratic Risk in Newly Public Firms: The Moderating Role of Firm Digitalization"

Dear Editor,

We express our sincere gratitude for the constructive feedback you provided, which has been instrumental in enhancing the quality of our manuscript to align with the esteemed standards of the journal.

In accordance with your insightful comments, we have meticulously revised the paper. We are confident that these amendments have significantly improved the clarity, accuracy, and overall quality of the work.

We are eager to move forward with the further revision of the manuscript if required.

Thank you once again for your guidance and the opportunity to enhance our manuscript. We look forward to the prospect of our study contributing to the journal.

Sincerely,

The Authors

The wording for moderating effect of the inverted U shape doesn't comply with the norm. Please see the paper below for an example, flatten the curve or shift the U shape to the right etc. It is not a deal breaker to cite this paper to move the paper forwrad.

Jia, F., Xu, Y., Chen, L. and Fernandes, K. (2023). “Does supply chain concentration improve sustainability performance: The role of operational slack and information transparency”, *International Journal of Operations & Production Management*

Response:

Dear Editor,

Thank you for your insightful comments and the opportunity to refine our manuscript. We understand your concern regarding the current terminology used to describe the moderating effect of the inverted U-shape in our study.

In response to your feedback, we have carefully reviewed the terminology as per the

example provided in the paper by Jia et al. (2023), and made the necessary revisions to our manuscript. We have adjusted the language to ensure that the description of the moderating effect is both accurate and aligns with the established norms within the literature.

We have also taken the liberty to add a citation to Jia et al. (2023) to acknowledge the source of our revised terminology and to align our paper with the current discourse in the field.

We appreciate your guidance in this matter and hope that our revisions meet with your approval. We look forward to the possibility of moving our paper forward in the review process.

Thank you for your suggestions!

Sincerely,

The Authors

The introduction is too long. You need to reduce the length by removing the peripheral parts. The paper in general is quite long. Please condense it to comply with the 12k words limit including figures and tables. Please allow 280 words for each figure or table. Appendices are not counted toward the word count.

Response:

Dear Editor,

Thank you for your valuable feedback on our manuscript. We understand your concerns regarding the length of the introduction and the overall manuscript.

We appreciate your assistance in improving our work and hope that our efforts have brought the manuscript to meet the standards of the journal. We are eager to move forward with the further revision of the manuscript.

Thank you again for your consideration and the opportunity to contribute to the journal.

Sincerely,

The Authors