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Firm-level political risk and intellectual capital investment: Does managerial ability matter?

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ABSTRACT

This paper examines the impacts of firm-level political risks on intellectual capital investment decisions and how managerial ability adjusts this relationship. Using a broad sample of U.S firms from 2002 to 2021, our results show that firms with higher political risks reduce their investment in intellectual capital. This impact is more prominent for high-tech firms and firms with high financial distress, external financial dependence, and lower institutional ownership. Further, we find supportive evidence that managerial ability can prevent a substantial dimension (around 20%–40%) of the destructive impact of political risk on intellectual capital investment, which is also driven by firm-specific characteristics. These findings hold after a battery of robustness tests.

1. Introduction

In the modern economy and integrated financial market, intellectual capital (also described as intellectual property) is progressively playing a crucial role in determining the effectiveness of businesses as well as the overall economic, management, technological, and sociological developments (Mouritsen & Larsen, 2005; Oliveira, Lima Rodrigues, & Craig, 2010). In recent years, the focus has altered from the capital-intensive to the information and knowledge-intensive industries, which is accredited to the augmented importance of intellectual capital for both practitioners and academics (Alvino, Di Vaio, Hassan, & Palladino, 2021; Su, 2014). Given the strand of literature on the phenomenon of knowledge management, the concepts of intellectual capital and intangible assets are extensively linked to each other (Hussi, 2004; Osinski, Selig, Matos, & Roman, 2017).[1] In other words, intellectual capital is the primary strength of innovative knowledge and constant effectiveness of businesses (Inkinen, Kianto, Vanhala, & Ritala, 2017) and shareholders' practical concerns (Tan, Plowman, & Hancock, 2008). Considering the ongoing debates around the impacts of political uncertainty on managerial decisions and financial outcomes, there is a handful of papers that consider the impacts of political risks and uncertainty on corporate investment (Azzimonti, 2018; Chen, Cihan, Jens, & Page, 2023; Gulen & Ion, 2016; Handley & Limao, 2015; Julio & Yook, 2012). By mainly focusing on general capital investment, prior studies suggest that firms decrease their overall investment during heightened uncertainty with preventative interruptions in capital expenditure, ascribed to investment irreversibility (Gulen & Ion, 2016). Therefore, understanding how firms alter their investment policies on intellectual capital in responding to political uncertainty remains limited. Further, the impact of political uncertainty on total corporate investment has been well documented at the aggregate levels. Prior studies utilize the aggregate measures of political uncertainty in terms of country-level uncertainty indices (such as Economic Policy Uncertainty – EPU and Geopolitical Risk Index (GRI) or major political events (such as Presidential Election periods). However, those aggregate measures could not capture the cross-sectional differences in firm-level exposure to political risk (Ahmad, Aziz, El-Khatib, & Kowalewski, 2023; Hassan, Hollander, Van Lent, & Tahoun, 2019). Although there is a wide body of literature

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[1] In a broader form, intangible assets are the firms' assets with no physical form, which can include knowledge related to legal ownership like patents, trademarks, copyrights, trade secrets, registered designs, goodwill, computer software, contracts, and databases (Marcelin, Stephen, Fanta, & Tecklezion, 2019). In this study, we focus on the indicator of intellectual investment proposed by Sydler et al. (2014) rather than exhaustively identifying the differences between the two concepts.

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on the drivers behind investment in intellectual capital, which is critical to firms' long-term development, the relationship between the firm-specific political risks and intellectual capital investment is a relatively unexplored question.

Given the unique characteristics of intellectual capital, such as difficulties in measuring, long payback period, and higher risks (D'Amato, 2021). A comprehensive insight into the connection between firm-level political risks and intellectual capital and the factors involved in such a relationship is critical to a corporate strategy and has significant implications for policymakers and stakeholders in the financial markets. Hence, in this study, we seek to fill this gap in the extant literature by examining how idiosyncratic firm-level political risks affect firm investment in intellectual capital. In addition, inspired by prior studies on political uncertainty and managerial ability, we also explore how managerial ability shapes this relationship between firm-level political risk and intellectual investment. Previous studies have shown that managerial ability is deemed a strategic intangible asset of organizations, given its intense impact on structural effectiveness (Chemmanur, Paeglis, & Simonyan, 2009; Demerjian, Lev, & McVay, 2012). Firms with better managers can identify beneficial investment prospects, have a superior capacity to estimate demand, choose quality projects, understand risk, and thus can maximize investment efficiency (Gan, 2019; Lee, Wang, Chiu, & Tien, 2018). In other words, managerial ability is appreciably crucial in seeking better investment opportunities during uncertain periods (Andreou, Karasamani, Louca, & Ehrlich, 2017; Hassan et al., 2019; Kumar & Zbib, 2022).

Using a broad sample of the 3688 U.S publicly listed firms covering the period from 2002 to 2021, we examine the effect of firm-level political risks proposed by Hassan et al. (2019) on corporate intellectual capital investment and the moderated function of managerial capability in this relationship. Our analyses produce the following main findings. First, firm-level political risk, proxied by political exposure and risk, negatively and significantly impact firms' intellectual capital investment in a subsequent year. Second, our results show that firms with higher financial distress and external finance dependence exhibit a more significant reduction in intellectual capital investment. The extent of this negative impact also depends on firm-level governance, as it is less significant for firms with higher institutional ownership. Third, utilizing the managerial ability scores developed by Demerjian et al. (2012), we find that the negative impact of political risk on intellectual capital investment is negative and statistically significant regardless of the managerial ability scores. However, the results also confirm that firms with higher managerial ability scores are less concerned about political risk than those with lower scores. The differences in economic magnitude further reveal that a higher level of managerial ability enables firms to lower a substantial proportion (around 20% to 40%) of the unfavorable influence of firms' political risk on their intellectual capital investment. In addition, the moderated impact of managerial ability also depends on firms' levels of financial distress, external finance dependence, institutional holding, and analyst coverage. Further, we also verify that the impacts of political risk are less visible for non-high-tech firms as they have fewer intellectual assets to be concerned about. However, the power of managerial ability is not sensitive to technological-related factors. Our results remain unchanged under a battery of robustness checks using alternative variables and sensitivity analyses to control potential endogeneity concerns.

Our study contributes to the extant literature in the following ways. First, to the best of our knowledge, this is the first study to consider the impacts of firm-level political risk on corporate intellectual capital investment, which has yet to draw much attention. Complementing prior studies, our findings show that firm-level political risk has non-trivial impacts on intellectual capital investment above and beyond that of economywide political risk, as reported by Hoang and Tran (2022) and Chen et al. (2023). Using firm-level political risk constructed from the textual search approach by Hassan et al. (2019), we can better capture the idiosyncratic exposure to political ambiguity across firms and overcome the barriers of macro uncertainty measures observed in prior studies. Further, we also document that the relationship between firm-level political risk and intellectual capital investment is shaped by several firm characteristics. As such, this study can extend the current literature on how political uncertainty/risk influences corporate investment as well as corporate decisions (Azzimonti, 2018; Choi, Chung, & Wang, 2022; Gulen & Ion, 2016; Gyimah, Danso, Adu-Ameyaw, & Boateng, 2022).

Second, this paper differs from prior studies in that we focus on the impacts of managerial ability on moderating the nexus between political risk and intellectual capital investment. Given the extant literature, few studies have utilized the Demerjian et al. (2012) measure to examine whether managerial ability can moderate the adverse effects of uncertainties. For instance, prior studies mainly focus on the impacts of managerial ability on corporate performance and activities, such as earnings quality (Demerjian, Lev, Lewis, & McVay, 2013), financial performance (Cheung, Naidu, Navissi, & Ranjeeni, 2017), or payout policies (Guan, Li, & Ma, 2018). Two studies of particular interest and close to our research are Phan, Tran, Nguyen, and Le (2020) and Kumar and Zbib (2022), which consider the association between Demerjian et al. (2012) managerial ability measure and financial performance during periods of oil price uncertainty and COVID-19 crisis, respectively. Therefore, this study can enrich the current literature on the importance of managerial ability associated with performance, investment decisions, and survival of firms at times of uncertainty. From the starting point of this study, several practical implications can be proposed for practitioners, shareholders, and policymaking in evaluating capital investment opportunities, especially during the increasing uncertainty stages. The practical implications for firms are also proposed by drawing their attention to the associations between intellectual capital, political uncertainties, and the power of managerial capability. Not only highlighting the importance of the development of intellectual capital, but our results also provide suggestions for shareholders in considering top executives' professional experiences and expensing their compensation.

The remainder of the paper is organized as follows. Section 2 summarizes related literature on political risks, investment, and managerial ability. Section 3 describes the data, variable constructions, and baseline methods. Section 4 presents the main results. The robustness and additional tests are reported in Section 5, and Section 6 concludes the study.

2. Related literature

2.1. Political risk, corporate investment policies, and intellectual capital investment

Political risk or uncertainty is described as risks generated from political events, such as wars, terrorism, inter-nation conflicts, or unstable political environment (Caldara & Iacoviello, 2022; Vu, Huynh, Phan, & Hoang, 2023). At the aggregate level, political risks negatively impact economic development, employment, investment, and financial market stability (Acemoglu & Robinson, 2001; Bekaert, Harvey, Lundblad, & Siegel, 2016; Huynh, Dao, & Nguyen, 2021). A rich strand of studies considers the impacts of political risks on corporate activities and performance at the industry and firm levels. The increase in political uncertainty entails firms implementing more cautionary decisions by increasing cash holding (Duong, Nguyen, Nguyen, & Rhee, 2020), reducing financing (Çolak, Durnev, & Qian, 2017; Dai & Ngo, 2021; Lee et al., 2018), financial performance (Joshi, Cahill, Sidhu, & Kansal, 2013; Keillor, Wilkinson, & Owens, 2005), and corporate innovation (Ellis, Smith, & White, 2020). Also, considering the unfavorable condition generated by political uncertainty, King, Loncan, and Khan (2021); Le and Tran (2021); Alam, Houston, and Farjana (2023); Gulen and Ion (2016); and Caldara and Iacoviello (2022) confirm that higher level of political risk lowers corporate investment.

On the one hand, prior literature on the impacts of political risk on

corporate investment is mainly drawn from aggregate levels of political risk on major political events. One of the main shortfalls of this approach is the assumption that macro-level political risks homogeneously affect cross-sections of companies. Indeed, a specific political event cannot affect the whole economy, and emanated risks are not equivalently circulated across firms. To overcome those drawbacks of the aggregate measures, Hassan et al. (2019) quantify the firm-level exposure to political risks and uncertainties using the computational linguistics method. Using the textual analysis of quarterly earnings conference-call transcripts, the Hassan et al. (2019) firm-level political risk measure can capture more precise and relevant information on firms' political-related hiring, investing, lobbying, and donating activities (Ahmad et al., 2023). Furthermore, the firm-level political risk can effectively depict corporate self-awareness, which is influential for their decision-making on known information (Citroen, 2011). Subsequent studies confirm the impacts of firm-level political risk on overall corporate investment (Choi et al., 2022), financing decisions (Gyimah et al., 2022; Pan, Wang, & Yang, 2019), and corporate tax avoidance (Liu, Jin, Zhang, & Zhao, 2022).

Also falling within the scope of corporate investment policies, political uncertainty can significantly impact firms' investment decisions on intellectual capital. Generally, intellectual capital investment comprises innovation capital, human capital, and interpersonal capital investments that can be used to create wealth (Oliveira et al., 2010; Sydler, Haefliger, & Pruksa, 2014). As such, intellectual capital – not tangible assets or even financial capital is crucial tactical property as it is valuable, unique, and challenging to reproduce and thus a basis of competitive advantage (Joshi et al., 2013) and the concept of long-term value creation (Lerro, Linzalone, & Schiuma, 2014; Zhou & Fink, 2003). As intangible assets, prior studies have confirmed the critical relationship between intellectual capital and firm performance (Maditinos, Chatzoudes, Tsairidis, & Theriou, 2011), business reputation (Ginesti, Caldarelli, & Zampella, 2018), and financial management (D'Amato, 2021). Intellectual capital is a unique set of intangible assets which can contribute to a company's bottom line (Boekestein, 2006). Further, investment decisions on intellectual capital are risky investments with large investments, longer payback periods, and high failure rates (D'Amato, 2021; Sydler et al., 2014). Likewise, intellectual capital is significantly distinctive from physical assets because it is distinguished by higher firm specificity and human capital intensity (Dierickx & Cool, 1989). As a result, investment decisions on intellectual capital are expected to be significantly driven by political uncertainty. From the viewpoint of the real option theory, during the higher uncertainty stages, firms tend to reduce costly oversights by dropping their investment disbursement or postponing investment decisions to "wait" for more favorable conditions at some point (Dixit & Pindyck, 2012). Hence, when facing higher political risks, firms may reduce intellectual capital investment to control the total risk level and sacrifice their long-term development potential. Further, the confounding uncertainty can exacerbate corporate financial constraints and increase the costs of financing, which are hypothetical reasons to justify investment reduction (Hu & Gong, 2019). Recent studies examine how environmental guidelines impact corporate intellectual capital (Trevlopoulos et al., 2021) and how macroeconomic factors affect the connection between corporate innovation and intellectual capital (Ren & Song, 2021). At the aggregate level, a recent study by Hoang and Tran (2022) confirms the negative impacts of the Economic Policy Uncertainty Index (EPU) on the intellectual investment of UK firms. These conclusions confer cues to examine the unclear relationship between intellectual capital investment and firm-level political risk. However, given the current literature, the impacts of political risk on corporate investment have not attracted attention in prior studies. Based on the abovementioned arguments, we hypothesize that firms with higher political risks are more likely to reduce their intellectual capital investment than their counterparts.

2.2. The roles of managerial ability

In the word of the upper echelon theory, corporate executives maintain decisive roles in firms' operations such as investment policies (Bertrand & Schoar, 2003; Welch & Yoon, 2022; Pan, Wang and Weisbach, 2016) and risk-taking (Lewellyn & Muller-Kahle, 2012; Pathan, 2009). Hence, the essential managerial attribute predominantly stanches from a manager's understanding of the market to propose corporate plans and technology (Kor, 2003). A handful of studies backed this view by acknowledging the economically significant roles of managerial ability in their firms' strategies and performance. A study by Bertrand and Schoar (2003) confirms a substantial divergence in investment, financial, and organizational decisions, which the managing styles can explain. Chang, Dasgupta, and Hilary (2010) suggest a pronounced connection between firm performance managers' traits or experiences. Considering the IPO performance, Chemmanur and Paeglis (2005) confirm that more able managers can obtain more profitable projects to proceed with IPO, improving the overall financial performance. Similarly, findings by Cheung et al. (2017), Banker, Darrough, Huang, and Plehn-Dujowich (2013), and Chemmanur, Paeglis, and Simonyan (2010) also support the positive effects of management quality and corporate performance.

In addition, high-quality managers are better at understanding risks and overall market dynamics, more precisely predicting the product marketplace, and administering human resources compared with their counterparts (Demerjian et al., 2012). In other words, more able managers can obtain more accurate information regarding investment prospects, granting firms better investment decisions and an elevated likelihood of success (Hasan, Alam, Paramati, & Islam, 2022). Regarding risk management, managerial ability also exert positive impacts on corporate investment during the crisis period (Andreou et al., 2017). Firms with higher managerial ability are expected to respond better to economic pressures, competitive market, and environmental uncertainties by better utilizing organizational resources and grasping promising investment prospects (; Demerjian et al., 2013). Hence, higher-quality firm management can enhance firms' capability to execute more innovative policies, shaping risk-taking behavior and responding to unexpected uncertainties (Andreou et al., 2017; Chen, Tseng, & Hsieh, 2015; Yung & Chen, 2018). In addition, the prominent roles of manager ability also exhibit in capital management and raising capital finance. For instance, more able managers can do better in negotiating or dealing to get better external financing sources (Chemmanur et al., 2009). In other words, higher managerial ability can reduce information asymmetric between firms and creditors; therefore, firms can obtain lower cost of debts (Owusu, Kwabi, Ezeani, & Owusu-Mensah, 2022).

The preceding debate directs us to suggest that managerial ability is a valuable factor in firms' policies for intellectual capital investments, especially for firms with higher revelation to political risk. Less able management teams tend to switch funds towards short-term and less risky investments during more uncertain periods (Nadeem, Zaman, Suleman, & Atawnah, 2021). In other words, more able managers are expected to manage better intellectual capital investments, usually long-term investments with unreliable settlements (D'Amato, 2021). Taken together, more able managers can maintain investment scales, including intellectual capital, when firms are more exposed to political uncertainties, owing to better financial resources management and reducing underinvestment puzzles. As such, we hypothesize that managerial ability, reflected in a more genuine managerial capacity (Demerjian et al., 2012), is a crucial channel to modify the impacts of firm-level political risks on intellectual capital investment.

3. Data and method

3.1. Data

To inspect the connection between firm-level political risk and intellectual capital (IC) investment, we utilize the sample of all U.S listed firms from CRSP/Compustat Merged database, which provides the annual financial data from 2002 to 2021. The firm-level political risk measures are obtained from the dataset of Hassan et al. (2019),[2] which is standardized by deducting the sample mean and dividing by the standard deviation. Those measures can directly quantify the cross-sectional and time varying in firms' exposure to related political and regulatory uncertainty and political events. In this study, we employ two indicators of *Political Risk* and *Political Exposure* to capture political risk at the firm level. *Political Risk* is constructed by counting all political bigrams, such as "political risk", "politically risky", "politically uncertain", or "political uncertainty" from firms' earnings conference call transcripts. *Political Exposure* is constructed by counting all political bigrams by excluding the terms "risk" or "uncertainty". In addition, we also utilize eight components of the *Political Risk*, as in Hassan et al. (2019), to further consider the impacts of firm-level political risks on intellectual capital investment.[3] Hassan et al. (2019) also posit that, overtime and across industries, there is only a small portion of fluctuations in firm-level measures can be justified by changes in the aggregate indices. Therefore, this firm-level measures confines important statistics not attained by aggregate indices employed in earlier studies. As Hassan et al. (2019) provide a dataset on a quarterly basis, we compute the annual indicators of political risk by taking the average of all quarters' values in a given fiscal year.

We also collect the managerial ability (MA) scores constructed by Demerjian et al. (2012) to differentiate the potential impacts of firm-level political risk on IC investment. To capture the levels of efficiency credited to the firm's managers, Demerjian et al. (2012) construct the MA scores by using a two-step process, including frontier analysis and data envelopment analysis (DEA) and regression to efficiency scores on firm-specific attributes.[4] This measure is assembled based on consistently accessible financial data overtime and comprises less noise than other managerial ability indicators (Demerjian et al., 2012). Therefore, this measure of managerial ability has been extensively utilized and well-renowned in finance literature (Andreou et al., 2017; Demerjian et al., 2013; Kumar & Zbib, 2022; Lee et al., 2018; Phan et al., 2020).

We also apply the standard data filtering approaches: (1) removing firm-year observations for financial institutions (SIC 6000–6999), regulated utilities (SIC 4900–4999), and unclearly-defined industries, (2) excluding firms with missing data for all variables used in the main models, (3) including only firms with at least three years of data and (4) winsorizing all continuous variables at 1% level on both sides. Our final sample of non-missing information of 29,504 firm-year observations from 3688 unique firms spanning from 2002 to 2021. The descriptions of all variables are reported in Table 1.

Table 1
Variable definitions.

Variable	Definition	Source
Intellectual capital		
Intellectual capital investment (ICI)	The natural logarithm of the ratio of intellectual capital (IC) investment on lagged total assets. IC investment is calculated by employing the IC accumulation rate (α) and the amortization rate (δ) proposed by Sydler et al. (2014).	Compustat and authors' calculations
Firm Political Risk		
Political Risk	The natural logarithm of the average of the transcript-based counts of the number of political bigrams of firms' conference call reports by using the computational linguistic procedure to evaluate the contents. The counts focus on risk or uncertainty bigrams, such as "political risk", "politically risky", "politically uncertain", or "political uncertainty" from firms' earnings conference call transcripts.	Hassan et al. (2019)
Political Exposure	The natural logarithm of the average of the transcript-based counts of the number of political bigrams of firms' conference call reports by using the computational linguistic procedure to evaluate the contents. The counts are not conditioned for risk or uncertainty bigrams by excluding the terms "risk" or "uncertainty"..	Hassan et al. (2019)
Components of Political Risk		
Political Risk - Economics	The economic policy-specific component of political risk equals the ratio of quarterly earnings conference calls of specific firms devoted to economic policy-related political risk.	Hassan et al. (2019)
Political Risk - Environment	The environment-specific component of political risk equals the proportion of quarterly earnings conference calls of specific firms devoted to environment-related political risk.	Hassan et al. (2019)
Political Risk - Trade	The trade policy-specific component of political risk equals the ratio of quarterly earnings conference calls of specific firms devoted to trade policy-related political risk.	Hassan et al. (2019)
Political Risk - Institutions	The institutions and political process-specific component of political risk equal the proportion of quarterly earnings conference calls of individual firms devoted to the institutions and political process-related political risk.	Hassan et al. (2019)
Political Risk - Health	The health policy-specific component of political risk equals the ratio of quarterly earnings conference calls of specific firms devoted to healthcare policy-related political risk.	Hassan et al. (2019)
Political Risk - Security	The security and defense policy-specific component of political risk equals the proportion of quarterly earnings conference calls of individual firms devoted to security and defense policy-related political risk.	Hassan et al. (2019)

(*continued on next page*)

[2] This dataset provides the political risk and exposure data at the firm level rather than the aggregate level. The data for this variable is publicly available at: https://www.policyuncertainty.com/firm_pr.html

[3] These eight constituents are constructed by quantifying specific political risk topics related to institutions, economics, trade, technology, taxes, health, environment, and security.

[4] As the data from Demerjian's database are available through 2020, we compute the MA score for all firms in our sample in 2021 by utilizing the simple moving average from MA during the past three years. This approach can be rationalized by long-term managerial ability, as in Doukas and Zhang (2021). For full details about this measure, please refer to Demerjian et al. (2012). The data for this variable is publicly available at: https://peterdemerjian.weebly.com/managerialability.html

Table 1 (*continued*)

Variable	Definition	Source
Political Risk - Tax	The tax policy-specific component of political risk equals the proportion of quarterly earnings conference calls of individual firms devoted to tax policy-related political risk.	Hassan et al. (2019)
Political Risk - Technology	The technology policy-specific component of political risk equals the proportion of quarterly earnings conference calls of individual firms devoted to technology and infrastructure policy-related political risk.	Hassan et al. (2019)
Firm-level control variables		
Firm Size	The natural logarithm of total assets computed over a firm's financial year.	Compustat
Market to Book ratio	The ratio of the market value of the common equity and its balance sheet value of the common equity computed over a firm's financial year.	Compustat
Leverage	The leverage ratio is the ratio of total debts and assets computed over a firm's financial year.	Compustat
Profitability	The ratio of total earnings to total assets is computed over a firm's financial year.	Compustat
Cash holdings	Measured by total cash plus marketable securities to lagged total assets computed over a firm's financial year.	Compustat
Sales growth	The annual growth in total sales is computed over a firm's financial year.	Compustat
Stock return	The buy-and-hold stock return of the financial year is computed over a firm's financial year.	Refinitiv
Institutional ownership	The fraction of shares institutional investors own in a firm's financial year.	Refinitiv
Board Size	Natural logarithm of the total number of directors on the board.	Boardex
CEO Duality	The binary variable takes the value one if the CEO also chairs the board and 0 otherwise.	Boardex
Managerial ability (MA)		
MA_HIGH	The dummy variable equals one if the firms' managerial ability scores in year t are higher than the whole sample mean over the examined period or equals zero.	Demerjian's database and authors' calculations
MA_LOW	The dummy variable equals one if the firms' managerial ability scores in year t are lower than the whole sample mean over the examined period or equals zero.	

This table describes the definitions of variables used in the analyses with the data sources.

3.2. Intellectual investment measures

Following prior literature on intellectual capital, we utilize the adjusted residual income model proposed by Sydler et al. (2014).[5] As the intellectual capital level is not reported in the firm's financial reports, this approach utilizes the intellectual capital-creating expenses (IE) by adding up the three proxies: labour expenses (HE), R&D expenditures (RE), and advertising expenses (AE), for intellectual capital. The IC investment is computed using the IC accumulation rate (α) and the amortization rate (δ). Sydler et al. (2014) also assume that the growth factor (g) is constant for IC-creating expenses (IE), which is the risk-free rate of the average six-month US treasury bill, as suggested by Ballester, Livnat, and Sinha (2002). The value of the IC at the end of the period is computed as follows:

$$IC_t = \alpha(HE_t + RE_t + AE_t) + (1-\delta)(IC_{t-1}) = \alpha(IE_t) + (1-\delta)(IC_{t-1}) \quad (1)$$

IC_t is the intellectual capital at time t, α is the accumulation rate ($0 < \alpha < 1$), and δ is the amortization rate ($0 < \delta < 1$). It means that we can capture the levels of IE accumulated in IC during the current financial year - $\alpha(IE_t)$ and levels of prior year IC investment remains after considering amortization $(1-\delta)(IC_{t-1})$. Then, we apply the value of IC_{t-1} recursively results in IC_t in the following equation:

$$IC_t = \alpha(IE_t)\left[1 + \frac{1-\delta}{1-g} + \left(\frac{1-\delta}{1-g}\right)^2 + \ldots + \left(\frac{1-\delta}{1-g}\right)^t\right] = \alpha(IE_t)\left[\frac{1+g}{\delta+g}\right] \quad (2)$$

With the model of Sydler et al. (2014), we obtain the values of 0.752 for α and 0.0124 for δ in our U.S sample. It indicates that 75.2% of existing IE is accrued to generate IC on a yearly basis, while total IC amortizes at the rate of 1.24% from prior year values. Then, we apply Eq. (2) to calculate the value of IC investment for each firm in a given fiscal year. After obtaining the annual levels of IC, we construct the primary dependent variable using the log-transformed ratio of IC investment to the lagged total assets ($TA_{i,t-1}$). In other words, our primary dependent variable is the intellectual capital investment - $ICI_{i,t}$, which equals to $ln\left(\frac{ICI_{i,t}}{TA_{i,t-1}}\right)$. To strengthen our findings, we also employ two alternative measures of ICI, including modification of Sydler et al. (2014) approach and the value-added intellectual coefficient (VAIC) approach proposed by (Pulic, 2000), which are reported in Section 4.1.

3.3. Bassline models

To estimate the impacts of firm-level political risk and IC investment, the regression model takes the following form:

$$ICI_{i,t} = \alpha_0 + \beta_1 PR_{i,t-1} + \sum \delta_k Controls_{i,t-1} + \varepsilon_{i,t-1} \quad (3)$$

where, $ICI_{i,t}$ is our main variable of interest - the intellectual capital investment of firm i in year t. *PR* is the firm-level *Political Risk* and *Political Exposure*. Controls include firm-specific variables that are standard for the IC and corporate investment literature (Gulen & Ion, 2016; Hoang & Tran, 2022; Sydler et al., 2014). We also control for firm-fixed, industry-fixed, and time-fixed effects in all equations, and all standard errors are clustered at the firm level. The descriptions of all variables are reported in Table 1.

Following Phan et al. (2020) and Demerjian et al. (2013), we divide the sample into high-score firms (*MA_HIGH*) and low-score firms (*MA_LOW*) by comparing the annual firms' MA scores to the whole sample mean over the examined period. Then, we utilize the following regression model:

$$ICI_{i,t} = \alpha_0 + \alpha_1 Political\ Risk_{i,t-1} + \beta_1 Political\ Risk_{i,t-1} \times MA\_HIGH_{i,t-1} + \beta_2 Political\ Risk_{i,t-1} \times MA\_LOW_{i,t-1} + \sum \delta_k Controls_{i,t-1} + \varepsilon_{i,t-1} \quad (4)$$

where, *MA_HIGH* (*MA_LOW*) is a dummy variable, which equals one if the MA score of firm i in year t is higher (lower) than the mean of all firms over the sample period or equals zero otherwise. The set of main variables, controls, and fixed effects are identical to Eq. (3). This model allows us to directly capture the economic significance for each MA

[5] For recent literature on intellectual capital that utilized the method of Sydler et al. (2014), see Osinski et al. (2017), Hoang and Tran (2022), Kweh, Lu, Tone, and Nourani (2022), and others.

Table 2
Summary statistics and univariate results.

Panel A. Descriptive statistics

Variable	Mean	S.D.	Min	Median	Max	N
Intellectual capital investment						
Intellectual capital investment (ICI)	3.549	1.721	0.145	3.126	8.040	29,504
Firm political risk						
Political Risk	−0.075	0.856	−0.535	−0.294	−0.002	29,504
Political Exposure	−0.084	0.832	−0.599	−0.324	−0.002	29,504
Firm-level control variables						
Firm Size	7.864	1.732	5.713	7.381	9.901	29,504
Leverage	0.222	0.186	0.000	0.192	0.454	29,504
Profitability	0.034	0.108	−0.045	0.040	0.125	29,504
Cash holdings	0.186	0.172	0.012	0.090	0.387	29,504
Sales growth	0.081	0.187	−0.106	0.049	0.235	29,504
Stock return	0.118	0.345	−0.267	0.069	0.432	29,504
Institutional ownership	0.509	0.448	0.000	0.487	0.908	29,504
Board Size	1.966	1.730	0.000	1.879	3.503	29,504
CEO Duality	0.169	0.158	0.000	0.000	1.000	29,504

Panel B. Univariate analyses

Univariate analyses	Political Exposure			Political Risk		
	High	Low	Difference	High	Low	Difference
Intellectual capital	**2.662**	**4.472**	**−1.810*****	**2.538**	**4.564**	**−2.026*****
Firm Size	8.068	7.667	0.401**	8.336	7.471	0.865***
Leverage	0.221	0.223	−0.002	0.219	0.224	−0.005
Profitability	0.029	0.039	−0.010**	0.028	0.040	−0.012***
Cash holdings	0.196	0.182	0.014*	0.202	0.156	0.046**
Sales growth	0.071	0.082	−0.011***	0.069	0.085	−0.016***
Stock return	0.116	0.121	−0.006*	0.113	0.126	−0.012**

This table presents the summary statistics and univariate analysis in Panel A and B, respectively. The sample consists of 3688 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). The firm-specific variables include *Firm Size, Market to Book ratio, Leverage, Profitability, Cash holdings, Sales growth, Stock return, Institutional ownership, Board size,* and *CEO duality.* All continuous variables are winsorized at the 1st and 99th percentiles. Panel B shows the mean differences for the subsamples with high and low firm-level *Political Risk* and *Political Exposure* using a two-sample *t*-test. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

group and compute the magnitude of differences.

4. Baseline results

4.1. Firm-level political risk and IC investment

Table 2 presents the summary statistics and univariate analyses of selected variables in this study. We only report the statistics for variables in our main models for brevity. In Panel B, to perform our univariate analyses, we split our sample into *High* and *Low* subsamples based on the means of firm-level *Political Risk* and *Political Exposure*. Across two indicators of PR, we observe that firms with high PR are highlighted with a lower IC investment compared to those with lower PR. The mean differences of ICI for high and low PR are all statistically significant at a 1% level, suggesting that high-PR firms are more likely to reduce their investment in ICI than low-PR firms. Similarly, considering the statistically significant test-of-difference values for other variables, our results indicate that high high-PR firms, when compared to low-PR firms, (1) are comparatively larger, (2) are less profitable, (3) hold more cash, (4) have lower sales growth, and (5) have lower annual stock returns. Overall, our preliminary subsample analyses suggest that firms with high PR have considerably different firm characteristics compared to low-PR firms, especially the firms' intellectual capital investment levels. In Appendix A, we also present the Pearson correlations in Table A for all main and control variables. Overall, the correlation coefficients between ICI and PR indicators are negatively significant, indicating that firms facing higher levels of political risk reduce their IC investment. This lends early support to our prediction for the relationship between firm-level political risk and IC investment.[6]

We present the baseline results in Table 3 for the impacts of firm-level PR, proxied by *Political Risk* and *Political Exposure,* on firms' intellectual capital investment. Utilizing the multivariate regression from Eq. (1), we perform two modified models with and without industry-fixed effects in (1) and (2), respectively.[7] In Column (1), the estimated coefficients of *Political Exposure* and *Political Risk* are all negative (−0.132 and − 0.194) and statistically significant at a 1% level, indicating the negative impact of *PR* on *ICI*. With the industry fixed effect in Column (2), the estimated coefficients for *Political Risk* and *Political Exposure* remain negative and statistically significant at the 1% level. Given the economic significance of two PR indicators, the impacts of *Risk* are relatively stronger compared to *Exposure,* suggesting that firms' intellectual capital investment decisions are more sensitive to political hazards than basic exposure to political uncertainties. For the control variables, profitability and sales growth also positively and significantly impact intellectual capital investment.[8] In Appendix B1, we also

[6] In untabulated results, our main variables do not suffer from the multicollinearity issues supported by the VIF tests.

[7] For all following tables, we perform all regressions with industry fixed effect as all modified models provide statistically similar outcomes.

[8] For robustness, we have re-estimated our main estimations from Equation (3) and (4) by including one- to three-year lags of the dependent variable and models without and with lagged control variables. Overall, the untabulated results remain qualitatively unchanged that firm-level political risk has negative impacts on IC investment. Those additional tests also suggest that our results are robust to within-firm autocorrelation.

Table 3
Firm-level political risk and intellectual capital investment.

Dependent variable: Intellectual Capital Investment (ICI)	Political Exposure		Political Risk	
	(1)	(2)	(1)	(2)
Political Exposure	−0.132***	−0.125***		
	(0.012)	(0.011)		
Political Risk			−0.194***	−0.191***
			(0.009)	(0.008)
Firm Size	−0.138**	−0.126*	−0.040	−0.053
	(0.142)	(0.165)	(0.231)	(0.228)
Leverage	−0.239**	−0.166	−0.201	−0.145
	(0.050)	(0.259)	(0.161)	(0.234)
Profitability	0.322**	0.420***	0.389***	0.410***
	(0.045)	(0.012)	(0.020)	(0.018)
Cash holdings	0.018	0.017	0.023	0.026
	(0.109)	(0.100)	(0.099)	(0.057)
Sales growth	0.167***	0.124***	0.175***	0.212**
	(0.009)	(0.013)	(0.008)	(0.005)
Stock return	0.229*	0.206	0.232*	0.211
	(0.072)	(0.227)	(0.080)	(0.209)
Institutional ownership	−0.016	−0.012	0.015	0.012
	(0.131)	(0.145)	(0.198)	(0.197)
Board Size	0.364	0.388	0.294	0.273
	(0.287)	(0.128)	(0.374)	(0.392)
CEO Duality	−0.121	−0.124	−0.131	−0.116
	(0.115)	(0.104)	(0.251)	(0.357)
Constant	1.113***	2.463***	1.755**	2.318***
	(0.057)	(0.020)	(0.121)	(0.057)
S.E. clustered by Firm	Yes	Yes	Yes	Yes
Firm-fixed effect	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes
Industry-fixed effect	No	Yes	No	Yes
Observation	29,504	29,504	29,504	29,504
Adjusted R-squared	0.702	0.770	0.805	0.823

This table presents the results of OLS regression models investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

examine the impacts of eight political risk category-based indicators. The results indicate that only Economic Policy, Environment, and Tax Policy risks exert adverse and substantial effects on firms' IC investment, which aligns with the findings of Hassan et al. (2019). First, by following the approach of Phan et al. (2020), we utilize the sub-sample analysis for eight sectors in Appendix B2, including Consumer staples, Consumer Discretionary, Health care, Information technology, Commercial services, Industrials, Energy, and Materials. Overall, our results are significant for all eight sectors, confirming our main findings.

Given the attention of political uncertainties, higher PR means that firms suffer both underlying costs (reducing reputation and competitive advantage) (Hassan et al., 2019; Keillor et al., 2005) and explicit costs (increase in the cost of financing, reducing firms' asset returns and cash flows) (Brogaard & Detzel, 2015; Huynh, 2023; Mishra, 2023). Therefore, firms with high PR are more likely to reduce their investment, namely intellectual capital, due to profitability uncertainties and potential default on financial commitments. Further, firm-level PR increases managerial conservatism as managers become more risk-averse during high-uncertainty periods (Hasan et al., 2022; Panousi & Papanikolaou, 2012). As a result, firms maintain more extensive cash reserves and reduce their investment. Overall, our findings link and expand prior literature on the impacts of uncertainties on corporate investment (Choi et al., 2022; Handley & Limao, 2015), human capital (Naidenova, 2022), and corporate innovation (Huang & Yuan, 2021).

It is noticeable that firm-level PR also imitates the tremors from the surrounding political or policy environment (Mishra, 2023). Hence, the nexus between firm-level PR and ICI possibly reflects the impacts of such aggregate political uncertainties. To confirm that our results do not carry the effect of aggregate political risk in prior studies, we further perform horse race regressions by imitating the baseline model- Eq. (3) in Table 4. In this analysis, we further control for two economywide political uncertainty indices of Geopolitical Threats (GT) and Geopolitical Risk Index (GRI) developed by Caldara and Iacoviello (2022).[9] As the Caldara and Iacoviello (2022) data is on a monthly basis, the GT and GRI are computed from 12 monthly values captured from the financial year-start month to the financial year-end month. In Table 4, the estimated coefficients on GT and GRI are negatively significant. Further, upon controlling for the aggregate political uncertainty indices, the *Political Risk* and *Political Exposure* continue to load with positive and significant coefficients at the 1% level. As such, the impact of firm-level PR on intellectual capital investment is unique and is in addition to the aggregate political risks.[10]

Having established a robust relationship between a firm's political risks and intellectual capital investment, we seek to validate the cross-sectional heterogeneity by which PR affects ICI in Table 5. First, we create dummy variables by utilizing six firm-specific factors, including financial distress - FD (KZ index[11] and Altman' (1968) *Z*-score[12]) (Chen & Wang, 2012; Phan et al., 2020), dependence on external finance - EFD[13] (Rajan & Zingales, 1998), institutional ownership, HHI[14] (Herfindahl–Hirschman Index of Institutional Ownership) (Choi et al., 2022), and information efficiency (IE) proxied by Analyst Coverage (Chang, Dasgupta, & Hilary, 2006). For each firm-a firm-specific factor, we create a dummy variable that equals one if the value of firm i in year t is higher (lower) than the mean of all firms over the sample period or equals zero otherwise. Then, we interact two proxies of PR with the identified dummy variables. As expected, all interaction terms in Panel A are negative and statistically significant for both FD and EFD. These results suggest that the adverse effects of political risk on intellectual capital investment are more prominent for firms encountering higher financial constraints and external financing. This finding is in line with prior corporate investment literature that firms need to ignore investment opportunities due to higher transaction costs (both debt and equity issuance) (Faulkender & Wang, 2006) and potential cash flow problems (Paquette, Huynh, & Vu, 2022).

In Panel B, we investigate other channels through which impacts of firm-level political risk on intellectual capital investment can be mitigated. Considering the interaction terms of institutional ownership and

[9] The indices are publicly available at: https://www.matteoiacoviello.com/gpr.htm

[10] In unreported results, we also include GT and GRI indices as control variables for all other tables (5 to 11). Overall, the results are strongly consistent with our current reported results. The results are available on request.

[11] Following a study by Baker, Stein, and Wurgler (2003), we compute the KZ Index as $-1.002 \times$ Cashflow $-39.368 \times$ Dividends $-1.315 \times$ Cash $+3.139 \times$ Leverage.

[12] Following Chen and Wang (2012), we compute the Altman *Z*-score as:$Z-score = 1.20X_1 + 1.40X_2 + 3.30X_3 + 0.60X_4 + 0.999X_5$, with X_1 to X_5 are working capital to book value of assets ratio, retained earnings to book value of assets ratio, EBIT to book value of assets ratio, the market value of equity to total liabilities ratio, and net sales to book value of assets ratio, respectively. The dummy variable equals to 1 for firms with higher financial distress if the value of the Altman Z-score is lower than 1.81.

[13] In this study, we compute the level of dependence on external finance (EFD) by following Rajan and Zingales (1998). The EFD is the difference between capital expenditures and cash flow from operations scaled by capital expenditures.

[14] The HHI - Herfindahl–Hirschman Index is computed from the sum of squares of the proportions of the firm's shares held by the top five institutional investors. The higher values of HHI indicate that the ownership is assembled within a handful of large institutional investors (Choi et al., 2022; Ferreira, Matos, Pereira, & Pires, 2017).

Table 4
Firm-level political risk and intellectual capital investment - controlling for aggregate political risk.

Dependent variable: ICI	Geopolitical Threats (GT)		Geopolitical Risk Index (GRI)	
	(1)	(2)	(3)	(4)
Political Exposure	−0.112***		−0.195***	
	(0.012)		(0.008)	
Political Risk		−0.137***		−0.201***
		(0.009)		(0.007)
GT	−0.051*	−0.060**		
	(0.088)	(0.076)		
GP			−0.144**	−0.132**
			(0.041)	(0.069)
Controls	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	Yes	Yes
Observation	29,504	29,504	23,603	23,603
Adjusted R-squared	0.495	0.665	0.667	0.762

This table presents the results of OLS regression models investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). Two economywide political uncertainty indices of Geopolitical Threats (GT) and Geopolitical Risk Index (GRI), developed by Caldara and Iacoviello (2022). We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

HHI, we observe that the mitigation effects of institutional holdings on political exposure and risk are positive and statistically significant. In other words, firms with higher institutional holdings, a proxy for good firm-level governance, can offset the effects of political exposure and risk on ICI. This governance mechanism efficiently enhances the firm's value and alleviates agency problems (Mishra, 2023). The interaction terms of IE are all positive but statistically insignificant, indicating that Analyst Coverage does not exert significant impacts on reducing the adverse effect of political risk on their intellectual capital.

4.2. Role of managerial ability and political risk-intellectual capital nexus

Given that crude firm-level political risk harms the firm's intellectual capital investment, we instantaneously investigate the role of managerial capability in this connection. Using the mean of firms' MA scores to split the sample into high-score firms (*MA_HIGH*) and low-score firms (*MA_LOW*), we utilize Eq. (4) to consider the modified impacts of MA in Table 6. In Panel A, we report the coefficients (β_1 and β_2) of the interaction term between *Political Risk* and *Political Exposure* and MA score dummy variables. In line with our prior findings, the effect of PR on ICI is negative and statistically significant. The results from the Wald test further confirm that the absolute values of β_1 are significantly lower than that of β_2, indicating that firms with lower scores of MA are more significantly impacted by political risks than those with higher MA scores. In other words, we can confirm that managers with better managerial ability can help lessen the harmful impacts of PR on ICI.

In Panel B, we further validate our results by considering the economic significance. We compute the economic impacts of one standard deviation change in firm-level *Political Risk* and *Political Exposure* on ICI for the whole sample and two sub-sample of high and low MA scores. We report the changes in ICI all in percentage points. On average, a one standard deviation increases in *Political Risk* and *Political Exposure* results in a 2.267 and 3.095 percentage points drop in ICI in the subsequent year. We also confirm that the heterogeneity for firms is clustered based on their MA scores. The IC investment declines 4.178 and 2.868 percentage points for high-MA firms, while it is 2.739 and 1.927 points for low-MA firms, for two indicators of PR. In the last four columns, we also report the actual and percentage differences in ICI between two clusters of MA scores. Higher MA helps firms reduce the negative impacts of *Political Exposure* on ICI by 31.82% compared to low-MA firms. For the *Political Risk,* the divergence between firms with low and high MA is higher, with a 34.44% reduction in intellectual capital investment. Briefly, the above findings imply that better managerial teams can moderate the destructive impacts of political risks on firms' intellectual capital investment opportunities (up to 35%), which collaborates with prior findings of Lee et al. (2018) and Gan (2019) on corporate investment. In other words, firms with higher managerial ability are more capable of realizing risk and aligning resources for corporate investment, such as intellectual capital, when exposed more to unexpected political uncertainties (Andreou et al., 2017; Demerjian et al., 2013).

To better identify the effect of managerial ability on the PR-ICI nexus, we rely on cross-sectional comparisons in Table 7. We consider four firm-specific factors of cross-sectional heterogeneity (See Table 4): Financial distress (KZ index), External financial dependence (EFD), Institutional ownership (IO), and Analyst Coverage (AC). We divide our sample into High and Low groups using the sample mean and then utilize Eq. (4) for each sub-sample. Panel A and B report the results for *Political Exposure* and *Political Risk,* respectively. Regarding the coefficient differences, the absolute value of β_1 is necessarily lower than that of β_2 across all sub-samples, which reconfirms that managerial ability can lower the adverse effect of PR on IC investment. Turning to the economic significance, the differences also reveal the reliability with our prior outcomes that high MA scores can help decrease the harmful effects of political risks from 20% to 40%. However, when we compare the different levels between high versus low sub-samples, the modified effect of MA also depends on firm firm-specific factors. Specifically, the effect is more significant for firms with higher FD and EFD and lower IO and AC than their counterparts (about 24% to 39% compared to 18% to 28%). Overall, our results corroborate that the significant role of managerial ability is more valuable for firms with poorer firm-level governance, greater financial constraints, and information asymmetry.

5. Robustness checks and additional analyses

5.1. Heterogenous impacts of political risks across sectors

In the first additional analysis, we extend our line of research by considering the sector-level heterogeneity in the relationship between political risk, intellectual capital investment, and managerial ability.[15] One scenario is that the negative impacts of PR on ICI are more visible for high-tech industry firms as they tend to rely more on intellectual capital than their counterparts. Therefore, we expect that high-tech firms will drive our results as they need to promptly alter their investment strategies in IC when faced with PR. In this section, we follow the approach of Loughran and Ritter (2004) to split our sample into two groups of high-tech firms and non-high-tech firms.[16] We then re-estimate the results using Eq. (4) and report the results in Table 8. Consistent with our prediction, we observe that high-tech firms are in the driver's seat. For both indicators of PR, high-tech firms are more sensitive to the change of political risk regarding more significant reductions in ICI, as evidenced by chi-square test comparisons on α_1.

[15] In Appendix B, we have confirmed the impacts of PR and ICI across eight sectors. In unreported results, we also utilize Equation (4) to consider the modified impacts of MA for those sectors, with the significant difference between high vs low MA groups. However, we do not find significant differences between those sectors regarding the power of MA.

[16] High-tech firms are classified as those in 4-digit SIC codes of 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3671, 3672, 3674, 3675, 3677, 3678, 3679, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7371, 7372, 7373, 7374, 7375, 7378, and 7379.

Table 5
Cross-sectional heterogeneity: firm-level political risk and intellectual capital investment.

Panel A: Financial Distress (FD) and External Finance Dependence (EFD)

Dependent variable: ICI	KZ index (high)		Altman Z-score (Low)		EFD (High)	
	(1)	(2)	(1)	(2)	(1)	(2)
Political Exposure	−0.144***		−0.103***			
	(0.018)		(0.028)			
Political Exposure × FD	−0.123**		−0.097**			
	(0.031)		(0.043)			
Political Risk		−0.129***		−0.183***		
		(0.011)		(0.011)		
Political Risk × FD		−0.175***		−0.124***		
		(0.010)		(0.018)		
Political Exposure					−0.103**	
					(0.025)	
Political Exposure × EFD					−0.141***	
					(0.007)	
Political Risk						−0.122***
						(0.011)
Political Risk × EFD						−0.125***
						(0.005)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observation	29,504	29,504	29,504	29,504	22,128	22,128
Adjusted R-squared	0.437	0.460	0.482	0.505	0.439	0.464

Panel B: Institutional ownership (IO) and Information efficiency (IE)

Dependent variable: ICI	Institutional ownership (High)		Herfindahl index (High)		Analyst Coverage (Low)	
	(1)	(2)	(1)	(2)	(1)	(2)
Political Exposure	−0.182***		−0.114**			
	(0.012)		(0.024)			
Political Exposure × IO	0.492**		0.120**			
	(0.022)		(0.024)			
Political Risk		−0.253***		−0.260***		
		(0.010)		(0.004)		
Political Risk × IO		0.207**		0.108**		
		(0.018)		(0.034)		
Political Exposure					−0.208***	
					(0.006)	
Political Exposure × IE					0.087	
					(0.198)	
Political Risk						−0.211**
						(0.018)
Political Risk × IE						0.017
						(0.389)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observation	29,504	29,504	29,504	29,504	20,948	20,948
Adjusted R-squared	0.463	0.497	0.395	0.462	0.442	0.374

This table presents the results of OLS regression models investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI) by considering the cross-sectional heterogeneity. The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). The Dummy factors are identified by firm-specific factors, which are interacted with the main indicators of firm-level political risks. In Panel A, the dummy equals one if firms are financially distressed, as defined by the KZ index, Altman *Z*-score, and External financial dependence (EFD). In Panel B, the dummy is equal to 1 if firms with high Institutional ownership, Herfindahl index, and low Analyst coverage. We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Regarding the results on MA, our results further confirm that firms with more able managers can considerably reduce the impact of PR on ICI. Notably, the economic magnitude for MA between two subgroups of high-tech and non-high-tech firms are insignificantly different, which surrounds 30%. In other words, the modified impacts of MA on the PR-ICI nexus are not heterogeneous across different sectors.

5.2. Alternative indicators of intellectual capital investment

To strengthen our findings, we employ various robustness tests with two alternative proxies of IC investment as the dependent variables. Following a study by Hoang and Tran (2022), we compute an alternative indicator as the new IC assets created during a fiscal year (A-ICI), which is the amount of IE accumulated into IC assets. A-IC is the log-transformed fraction between the product of IE and α scaled by the one-year lagged total assets. The second measure is the value-added intellectual coefficient (VAIC) approach developed by (Pulic, 2000), which is widely employed by prior studies (Nadeem et al., 2021; Soewarno & Tjahjadi, 2020). The VAIC approach implicitly determines intellectual capital as the sum of capital employed efficiency (VACA),

human capital efficiency (VAHU), and structural capital efficiency (STVA). Consequently, the VAIC approach provides information about the efficiency of both the tangible (capital employed) and intangible (human and structural capital) assets of a firm. Therefore, a higher value of VAIC highlights a better utilization of firms' resources for value-creation processes. The VAIC is computed as follows:

$$\text{VACA} = \frac{\text{VA}}{\text{Capital Employed}}; \text{VAHU} = \frac{\text{VA}}{\text{Human Capital}}; \text{STVA} = \frac{\text{Structural Capital}}{\text{VA}}$$

Where, *Value Added (VA) = Amortization + Depreciation + Operating Profit (OP) + Employees Cost (EC); Capital Employed = Total Assets - Intangible Assets; Human Capital = Total employees' salaries and wages which were paid annually; and Structural Capital = Value Added - Human Capital*. We use the baseline model- Eq. (3) for two alternative IC investment proxies and reported the results in Table 9. Overall, the main findings remain robust under two alternative proxies that firms with higher PR significantly reduce their ICI in the following year.

In the next robustness check, we apply Eq. (4) for two alternative ICI proxies and the managerial ability scores and report the results in Table 10. In Panel A, the Wald test results confirm that absolute values of β_1 are substantially lower than that of β_2, demonstrating that firms with lower MA scores are less affected by political risks than those with better MA scores. The economic significance in Panel B further confirms that firms with more able managers can lessen the harmful impacts of political risks (around 22% to 27%) on firms' intellectual capital investment. Overall, we find consistency with our prior results on the power of managerial ability when utilizing the alternative indicators of intellectual capital investment.

5.3. The impacts of U.S presidencies and elections

Prior studies confirm that political risk in the U.S is relatively lower during the presidency of the Democratic party (Blinder & Watson, 2016; Santa-Clara & Valkanov, 2003) and higher during election years (Marshall, Nguyen, Nguyen, & Visaltanachoti, 2018). Prior studies by Julio and Yook (2012) and Jens (2017) confirm that firms lessen their investment in the election years in relation to non-election years. In this section, we further consider an additional analysis of how the U.S presidency and elections modify the nexus between firm-level political uncertainties and intellectual capital investment. We utilize the interaction terms between political risk and exposure and two dummies of U.S presidencies (Democratic versus Republican) and Election years. The dummy of Democratic equals to one if the U.S president is a Democrat in the given financial year and zero otherwise. Similarly, the dummy of Election to one if the given financial year are election years, and zero otherwise. Then, we utilize the baseline model (Eq. 3) by adding two aforementioned dummies and reported the results in Table 11. In addition, we also document the potential impacts of the political environment by considering the U.S presidencies (Democratic versus Republican) and Election years. The estimated coefficients of the interaction terms of *PR × Democratic* are negative and significant, indicating that the impacts of firm-level political risk are more visible during election years due to higher levels of political uncertainty (Marshall et al., 2018). However, we observe that the modification impacts of Democratic presidencies on political exposure and risk are primarily insignificant.

Table 6
Managerial ability: firm-level political risk and intellectual capital investment.

Panel A: High versus low managerial ability

Dependent variable: ICI	Political Exposure	Dependent variable: ICI	Political Risk
	(1)		(2)
Political Exposure	−0.131***	Political Risk	−0.173***
	(0.007)		(0.023)
Political Exposure × MA_HIGH (β_1)	−0.107*	Political Risk × MA_HIGH (β_1)	−0.113**
	(0.105)		(0.019)
Political Exposure × MA_LOW (β_2)	−0.283**	Political Risk × MA_LOW (β_2)	−0.269***
	(0.038)		(0.023)
Controls	Yes	*Controls*	Yes
S.E. clustered by Firm	Yes	*S.E. clustered by Firm*	Yes
Firm/Time/Industry-fixed effects	Yes	*Firm/Time/Industry-fixed effects*	Yes
Observation	29,504	*Observation*	29,504
Adjusted R-squared	0.542	*Adjusted R-squared*	0.676
$\beta_1 - \beta_2$ *(Wald test)*	0.176***	$\beta_1 - \beta_2$ *(Wald test)*	0.156***
(p-value)	0.000	*(p-value)*	0.000

Panel B: Economic significance.

Dependent variable: ICI	All firms	Low managerial ability firms	High managerial ability firms
	(1)	(2)	(3)
Political Exposure	−2.267	−2.868	−1.927
Political Risk	−3.095	−4.178	−2.739
Difference (3)–(2)			
Political Exposure	0.941		
%	−32.81%		
Political Risk	1.439		
%	−34.44%		

This table presents the results of OLS regression models that investigate the effect of managerial ability (MA) on the relationship between firm-level political risk and corporate intellectual capital investment (ICI) by using Eq. (4). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). The Dummy of MA_HIGH (MA_LOW) is created using Demerjian's managerial ability score higher (lower) than the average score of all firms over the sample period or equal zero otherwise, which interacted with the main indicators of firm-level political risks. Panel A reports the differences from regression with the Wald test for the difference between β_1 and β_2. Panel B economic significance of one standard deviation change in the political risk on IC for firms with low and high managerial ability, and its percentage of differences. We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

5.4. Alternative econometric approaches and sensitivity analyses

Furthermore, we apply several alternative econometric approaches to alleviate endogeneity concerns regarding potential omitted variables that simultaneously impact both firm-level political risk and intellectual capital investment in Table 12. First, we confirm our findings and address the model's dynamic by employing the two-step system

Table 7
Cross-sectional heterogeneity: managerial ability, firm-level political risk, and intellectual capital investment.

Panel A: Political Exposure.

Firm characteristics	Regression results			Economic significance			
	Political Exposure × MA_HIGH (β_1)	Political Exposure × MA_LOW (β_2)	$\beta_1 - \beta_2$	High managerial ability firms	Low managerial ability firms	High-Low	%
High FD	−0.293***	−0.412***	0.119***	−2.409	−3.299	0.891	−27.00%
	(0.029)	(0.011)	(0.007)				
Low FD	−0.166**	−0.213***	0.047**	−1.789	−2.350	0.561	−23.88%
	(0.075)	(0.049)	(0.014)				
High EFD	−0.367***	−0.501***	0.140***	−2.529	−4.124	1.595	−38.68%
	(0.010)	(0.003)	(0.000)				
Low EFD	−0.185***	−0.234***	0.049**	−1.741	−2.240	0.499	−22.27%
	(0.059)	(0.026)	(0.027)				
High IO	−0.311***	−0.457***	0.145***	−2.404	−3.172	0.768	−24.20%
	(0.018)	(0.007)	(0.000)				
Low IO	−0.181**	−0.272***	0.091***	−1.994	−2.443	0.449	−18.37%
	(0.103)	(0.032)	(0.006)				
High AC	−0.249***	−0.382***	0.133**	−2.165	−3.044	0.879	−28.88%
	(0.025)	(0.013)	(0.034)				
Low AC	−0.209***	−0.355***	0.146***	−2.092	−2.901	0.809	−27.89%
	(0.036)	(0.015)	(0.004)				

Panel B: Political Risk

Firm characteristics	Regression results			Economic significance			
	Political Risk × MA_HIGH (β_1)	Political Risk × MA_LOW (β_2)	β_1 - β_2	High managerial ability firms	Low managerial ability firms	High-Low	%
High FD	−0.320***	−0.459***	0.139**	−3.050	−4.470	1.420	−31.76%
	(0.006)	(0.000)	(0.016)				
Low FD	−0.107**	−0.266***	0.159***	−1.987	−2.582	0.595	−23.04%
	(0.052)	(0.015)	(0.007)				
High EFD	−0.403***	−0.542***	0.140**	−3.307	−5.271	1.964	−37.25%
	(0.000)	(0.000)	(0.042)				
Low EFD	−0.214***	−0.299***	0.085*	−1.862	−2.609	0.747	−28.63%
	(0.014)	(0.011)	(0.098)				
High IO	−0.414***	−0.622***	0.208***	−2.993	−4.561	1.567	−34.37%
	(0.000)	(0.000)	(0.001)				
Low IO	−0.148**	−0.294***	0.146**	−2.168	−2.846	0.678	−23.81%
	(0.075)	(0.020)	(0.045)				
High AC	−0.227***	−0.375***	0.148**	−2.681	−3.601	0.920	−25.56%
	(0.003)	(0.001)	(0.041)				
Low AC	−0.246***	−0.359***	0.113*	−2.755	−3.583	0.828	−23.11%
	(0.002)	(0.001)	(0.087)				

This table presents the results of OLS regression models that investigate the effect of managerial ability (MA) on the relationship between firm-level political risk and corporate intellectual capital investment (ICI) by considering the cross-sectional heterogeneity and using Eq. (4). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). The Dummy of MA_HIGH (MA_LOW) is created using Demerjian's managerial ability score higher (lower) than the average score of all firms over the sample period or equal zero otherwise, which interacted with the main indicators of firm-level political risks. All firms are grouped into high and low Financial distress (KZ index), External financial dependence (EFD), Institutional ownership (IO), and Analyst Coverage (AC). We also report the differences from regression with the Wald test for the difference between β_1 and β_2. Panel A and B report the results for *Political Exposure* and *Political Risk*, respectively. We control for industry and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Generalized Method of Moments (S-GMM) estimations (Blundell & Bond, 1998). Prior studies confirm that the S-GMM approach can partially reduce the potential heterogeneity and omitted variable bias (Trinh, Aljughaiman, & Cao, 2020). In Panel A of Table 12, the findings are consistent with our main results that political risk and exposure negatively and significantly impact firms' intellectual capital investment. The subsequent identification test is a Placebo test by replacing the political risk measures of a given firm in a given year with a randomly drawn value from the sample and then re-estimate the baseline regression (Eq. 3). Overall, we can further reinforce the robustness of our baseline results as the estimated coefficients of the independent variable are statistically insignificant. In other words, this tests lend further support to reject potential endogeneity issues vis-à-vis the likelihood of having time-varying omitted variables that can instantaneously modify both firms' IC investment and their specific political risk. In Appendix C, we also address the omitted variables bias by employing the Oster (2019). Overall, our results support that the inferences from our models are highly unlikely to suffer from an omitted variable bias.

In Panel B, we further another endogenous-treatment method using the Two-Stages Least Square/Instrumental Variable Analysis (2SLS) to address the possible endogeneity of firm-level political risk measurement error. By following prior studies (Ahmad et al., 2023; Azzimonti, 2018), we utilize the Partisan Conflict Index as our instrumental variable (IV).[17] The Partisan Conflict Index is the level of political polarization or disagreement among politicians in the U.S, which is obtained from the Federal Reserve Bank of Philadelphia. This index can impact the firm-

[17] The Partisan Conflict Index has been extensively used as an instrumental variable in the economic policy and political uncertainty literature, such as by Gulen and Ion (2016); D'Mello and Toscano (2020); Pan et al. (2019); among others.

Table 8
Heterogenous impacts of political risks across high-tech and non-high-tech firms.

Panel A: Political Exposure				
Firm characteristics	Regression results			
	Political Exposure (α_1)	Political Exposure × MA_HIGH (β_1)	Political Exposure × MA_LOW (β_2)	β1 − β2 (Wald test)
High-tech firms	−0.299*** (0.006)	−0.189** (0.018)	−0.329*** (0.008)	0.140*** (0.022)
Non-high-tech firms	−0.155** (0.025)	−0.196*** (0.015)	−0.316*** (0.010)	0.120** (0.026)
Wald test on α_1 (p-value)	0.000			

Economic significance				
Firm characteristics	High managerial ability firms	Low managerial ability firms	High-Low	%
High-tech firms	−2.107	−3.128	1.021	−32.63%
Non-high-tech firms	−2.156	−3.097	0.941	−30.38%

Panel B: Political Risk				
Firm characteristics	Regression results			
	Political Risk	Political Risk × MA_HIGH (β_1)	Political Risk × MA_LOW (β_2)	β1 − β2 (Wald test)
High-tech firms	−0.355*** (0.002)	−0.204*** (0.014)	−0.387*** (0.008)	0.183*** (0.007)
Non-high-tech firms	−0.195*** (0.009)	−0.212*** (0.012)	−0.403*** (0.006)	0.191*** (0.006)
Wald test on α_1 (p-value)	0.000			

Economic significance				
Firm characteristics	High managerial ability firms	Low managerial ability firms	High-Low	%
High-tech firms	−2.347	−3.352	1.005	−29.99%
Non-high-tech firms	−2.438	−3.497	1.059	−30.29%

This table presents the results of OLS regression models that investigate the effect of managerial ability (MA) on the relationship between firm-level political risk and corporate intellectual capital investment (ICI) by considering the heterogeneity between high-tech and non-high-tech firms and using Eq. (4). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). The Dummy of MA_HIGH (MA_LOW) is created using Demerjian's managerial ability score higher (lower) than the average score of all firms over the sample period or equal zero otherwise, which interacted with the main indicators of firm-level political risks. All firms are grouped into high-tech and non-high-tech firms using the classification of Loughran and Ritter (2004). We also report the differences from regression with the Wald test for the difference between α_1 of two subgroups and β_1 and β_2. Panel A and B report the results for *Political Exposure* and *Political Risk*, respectively. We control for industry and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Table 9
Robustness checks: Alternative measures for intellectual capital investment and political risk.

Dependent variable: Alternative IC	A-ICI		VAIC	
	(1)	(2)	(3)	(4)
Political Exposure	−0.189*** (0.016)		−0.587** (0.045)	
Political Risk		−0.224** (0.008)		−0.792*** (0.007)
Controls	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	Yes	Yes
Observation	29,504	29,504	23,603	23,603
Adjusted R-squared	0.401	0.539	0.652	0.617

This table presents the results of OLS regression models investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). In Panel A, the intellectual capital investment is computed by using a modification from the approach of Sydler et al. (2014) and VAIC approach (Public, 2002, 2004). In Panel B, we further control for two economywide political uncertainty indices of Geopolitical Threats (GT) and Geopolitical Risk Index (GRI) developed by Caldara and Iacoviello (2022). We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

level political risks but is not probable to impact firms' IC investment. In the first stage, we estimate firm-level political risk and exposure using the Partisan Conflict Index. The estimated coefficients are positive and statistically significant, indicating that higher political conflicts give rise to higher levels of firm-level political risk. Also, the results for conventional tests (F-test, test of under-identification, and weak instruments) further confirm the Partisan Conflict Index as an appropriate IV. In the second stage, we estimate the results using instrumented firm-level political risk/exposure as the explanatory variables. We consistently obtain the negative and sizeable influence of firm-level political risk and exposure on intellectual capital investment. Generally, the results are consistent with our baseline findings when using IV-2SLS to control for the endogeneity concerns.

6. Conclusion

This paper intends to enrich the understanding of how firm-level exposure to political uncertainty affects corporate investment in intellectual capital and the role of managerial ability in this relationship. We investigate these effects using a U.S sample of 29,504 firm-year observations from 2002 to 2021. Our results confirm that firms' political risk is a destructive determining factor of corporate intellectual capital investment. The extent of this adverse effect depends on firms' financial distress, external finance dependence, and institutional holdings. Further, the intellectual capital investments of high-tech firms are more sensitive to their political risk due to the nature of their businesses. Our results also confirm that the adverse effect of firms' political risk on intellectual capital investment is significantly driven by managerial ability, where firms with lower managerial ability scores are concerned more than those with higher scores. Regarding the economic magnitude, a higher level of managerial ability facilitates firms to reduce a substantial proportion (approximately 20% to 40%) of the political risk-intellectual capital investment nexus. Further, we find that moderated role of managerial ability is more significant for firms with higher financial distress and external finance dependence and lower institutional ownership and analyst coverage. Our findings remain unchanged under several robustness checks and sensitivity analyses to control the endogeneity issue. Overall, this study proposes valuable implications for

Table 10
High versus low managerial ability with the alternative intellectual capital measure.

Panel A: High versus low managerial ability			
Dependent variable: A-ICI	Political Exposure	Dependent variable: A-ICI	Political Risk
	(1)		(2)
Political Exposure	−0.154***	Political Risk	−0.198***
	(0.011)		(0.001)
Political Exposure × MA_HIGH (β_1)	−0.097**	Political Risk × MA_HIGH (β_1)	−0.171***
	(0.066)		(0.011)
Political Exposure × MA_LOW (β_2)	−0.176***	Political Risk × MA_LOW (β_2)	−0.252***
	(0.018)		(0.006)
Controls	Yes	*Controls*	Yes
S.E. clustered by Firm	Yes	*S.E. clustered by Firm*	Yes
Firm/Time/Industry-fixed effects	Yes	*Firm/Time/Industry-fixed effects*	Yes
Observation	29,504	*Observation*	29,504
Adjusted R-squared	0.442	*Adjusted R-squared*	0.590
$\beta_1 - \beta_2$ *(Wald test)*	0.079**	$\beta_1 - \beta_2$ *(Wald test)*	0.081**
(p-value)	0.037	*(p-value)*	0.022

Panel B: Economic significance			
Dependent variable: A-ICI	All firms	Low managerial ability firms	High managerial ability firms
	(1)	(2)	(3)
Political Exposure	−2.643	−3.000	−2.339
Political Risk	−3.165	−3.687	−2.690
Difference (3)–(2)	(3)–(1)		
Political Exposure	0.661		
%	−22.03%		
Political Risk	0.997		
%	−27.04%		

This table presents the results of OLS regression models that investigate the effect of managerial ability (MA) on the relationship between firm-level political risk and corporate intellectual capital investment (ICI) by using Eq. (4). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using a modification from the approach of Sydler et al. (2014). The Dummy of MA_HIGH (MA_LOW) is created by using Demerjian's managerial ability score higher (lower) than the average score of all firms over the sample period or equals zero otherwise, which are interacted with the main indicators of firm-level political risks. Panel A reports the differences from regression with the Wald test for the difference between β_1 and β_2. Panel B economic significance of one standard deviation change in the political risk on IC for firms with low and high managerial ability, and its percentage of differences. We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Table 11
The impacts of U.S presidencies and elections.

Dependent variable: ICI	Political Exposure		Dependent variable: ICI	Political Risk	
	(1)	(2)		(1)	(2)
Political Exposure	−0.133***	−0.115***	Political Risk	−0.114***	−0.122***
	(0.011)	(0.012)		(0.011)	(0.010)
Election	0.264		Election	0.189	
	(0.067)			(0.051)	
Political Exposure × Election	−0.076**		Political Risk × Election	−0.102***	
	(0.012)			(0.010)	
Democratic		−0.027	Democratic		−0.032
		(0.018)			(0.015)
Political Exposure × Democratic		0.088	Political Risk × Democratic		0.065
		(0.025)			(0.026)
Controls	Yes	Yes	*Controls*	Yes	Yes
S.E. clustered by Firm	Yes	Yes	*S.E. clustered by Firm*	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	*Firm/Time/Industry-fixed effects*	Yes	Yes
Observation	29,504	29,504	*Observation*	29,504	29,504
Adjusted R-squared	0.396	0.365	*Adjusted R-squared*	0.506	0.348

This table presents the results of OLS regression models investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI) by considering the impacts of U.S presidencies and elections. The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). The Dummy factors are identified by the U.S presidencies (Democratic versus Republican) and Election years, which are interacted with the main indicators of firm-level political risks. We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Table 12
Alternative econometric approaches.

Panel A: Alternative models				
Variables	Two-step S-GMM		Placebo	
	(1)	(2)	(3)	(4)
Political Exposure	−0.144***		−0.073	
	(0.012)		(0.940)	
Political Risk		−0.211***		−0.037
		(0.007)		(0.241)
Controls	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	Yes	Yes
Observation	29,504	29,504	29,504	29,504
Adjusted R-squared	0.498	0.669	0.407	0.385

Panel B: Alternative models: 2SLS				
Variables	Political Exposure		Political Risk	
	First-stage	Second-stage	First-stage	Second-stage
Partisan Conflict Index	2.201**		3.456**	
	(0.022)		(0.011)	
Instrumented Political Exposure		−0.198**		
		(0.029)		
Instrumented Political Risk				−0.304***
				(0.000)
Joint test of excluded Instruments	*F-stat = 21.22***		*F-stat = 18.44***	
Test of under-identification	*24.43***		*19.75***	
Test of weak instruments	*23.77*		*25.33*	
Controls	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes
Firm/Time/Industry-fixed effects	Yes	Yes	Yes	Yes
Observation	29,504	29,504	29,504	29,504
Adjusted R-squared	0.548	0.562	0.573	0.517

This table presents the results of alternative approaches investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). Panel A reports the results from the two-step System Generalized Method of Moments and Placebo analyses. Panel B reports the results from Two-Stages Least Square/Instrumental Variable (IV-2SLS) analysis with Partisan Conflict Index as an IV. We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

academics, practitioners, stakeholders, and regulators in mitigating the political risk-induced capital investment possibility. As a final point, our study certainly reveals limitations that could be an open door for future research. Further study can focus on the impacts of geopolitical risks on specific outputs from IC investment, such as interpersonal, knowledge, and human factors, with more advanced measures. Further, a cross-country study with international data for firm-level political risk can provide miscellaneous standpoints of different institutional backgrounds.

Data availability

The authors do not have permission to share data.

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Appendix A. Appendix

A.1. Correlation Matrix

Table A1
Pearson correlation matrix.

Variables														
(1) Intellectual c1apital investment	1.000	–	–	–	–	–	–	–	–	–	–	–	–	–
(2) Political Risk	−0.513***	1.000	–	–	–	–	–	–	–	–	–	–	–	–
(3) Political Exposure	−0.448***	0.597***	1.000	–	–	–	–	–	–	–	–	–	–	–
(4) Firm Size	−0.160**	0.027	0.024	1.000	–	–	–	–	–	–	–	–	–	–
(5) Leverage	−0.105**	0.045*	0.036*	0.231***	1.000	–	–	–	–	–	–	–	–	–
(6) Profitability	0.370***	−0.374***	−0.325***	0.187**	−0.062**	1.000	–	–	–	–	–	–	–	–
(7) Cash holdings	0.136**	−0.347***	−0.413***	0.401***	−0.027	0.031	1.000	–	–	–	–	–	–	–
(8) Sales growth	0.483***	−0.178***	−0.158**	0.116**	−0.011	0.107**	0.009	1.000	–	–	–	–	–	–
(9) Stock return	0.326***	0.018	0.014	0.018	0.009	0.374***	0.045*	0.285***	1.000	–	–	–	–	–
(10) Institutional ownership	−0.079	0.009	0.007	0.223***	0.053	0.231***	0.080*	0.059	0.036	1.000	–	–	–	–
(11) Board Size	0.138*	0.018	0.016	0.320***	0.036	0.009	−0.030	−0.011	0.134*	0.303***	1.000	–	–	–
(12) CEO Duality	−0.109*	−0.027	−0.020	0.062*	0.059*	0.036	−0.043	0.017	0.036	0.134**	0.223***	1.000	–	–
(13) MA_HIGH	0.235**	0.039	0.047	0.027	0.015	0.490***	0.099*	0.250***	0.117**	0.036	−0.074*	0.045	1.000	–
(14) MA_LOW	−0.235**	−0.039	−0.047	−0.027	−0.015	−0.490***	−0.099*	−0.250***	−0.117**	−0.036	0.074*	−0.045	−1.000***	1.000

This table reports the Pearson correlations among the variables employed in this study. All continuous variables are winsorized at the 1st and 99th percentiles. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Appendix B. Additional tests

Table B1
Firm-level political risk components and intellectual capital investment.

Dependent variable: ICI	Political Risk							
	Economic Policy	Environment	Trade	Institutions	Health	Security & Defense	Tax Policy	Technology
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Political Risk	−0.323***	−0.118*	−0.039	−0.079	−0.017	−0.040	−0.287***	−0.056
	(0.000)	(0.010)	(0.204)	(0.157)	(0.450)	(0.391)	(0.000)	(0.210)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
S.E. clustered by Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm/Time/Industry -fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observation	29,504	29,504	29,504	29,504	29,504	29,504	29,504	29,504
Adjusted R-squared	0.406	0.441	0.350	0.470	0.569	0.538	0.676	0.447

This table presents the results of OLS regression models investigating the impact of eight components of firm-level political risk and corporate intellectual capital investment (ICI). The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk indicators are collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). We control for industry, firm, and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Table B2
Sectoral analyses: Firm-level political risk and intellectual capital investment

Sectors	Political Exposure		Political Risk	
	Coefficient	*p*-value	Coefficient	p-value
Energy	−0.128**	0.038	−0.112**	0.042
Consumer discretionary	−0.114**	0.044	−0.199***	0.006
Consumer staples	−0.104**	0.048	−0.124**	0.037
Communication services	−0.277***	0.000	−0.322***	0.000
Materials	−0.097**	0.049	−0.111**	0.042
Information technology	−0.220***	0.001	−0.295***	0.001
Industrials	−0.141***	0.007	−0.136**	0.026
Health care	−0.184***	0.003	−0.191***	0.005

This table presents the results of OLS regression models investigating the impact of firm-level political risk and corporate intellectual capital investment (ICI) for eight sectoral panels. The sample consists of 3668 U.S firms between 2002 and 2021. The firm-level political risk, proxied by political exposure and political risk, is collected from Hassan et al. (2019). The intellectual capital investment is computed using the approach of Sydler et al. (2014). We control for firm and time-fixed effects in all specifications. Standard errors are clustered at the firm level and are presented in parentheses under the associated coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The descriptions of all variables are reported in Table 1.

Appendix C. Oster (2019) tests for omitted variable bias

In this study, we employ the statistical test proposed by Oster (2019) to handle the potential omitted variable bias in our models. Oster (2019) assumes that the power of coefficients linked to the R-squares from regressions with and without controls can be preserved to generate an identifiable set. We exploit the Mian and Sufi (2014) assumptions of Oster (2019) to fabricate the lower and upper bounds of the identified set, with $\delta = 1$ and $R_{max} = \min(2.2\tilde{R}, 1)$ and the extreme ones from Oster's study of $\delta = 1$ and RMAX = 1.

Table C1
Omitted variable bias – Oster (2019).

Oster Condition	Dependent Variables	Variable of interest	Lower Bound	Upper Bound	Includes Zero?
Assume $t = 1$; RMAX = $\min(2.2\tilde{R}, 1)$	Intellectual capital investment (ICI)	Political Exposure	0.0362	0.0758	No
Assume t = 1; RMAX = $\min(2.2\tilde{R}, 1)$	Intellectual capital investment (ICI)	Political Risk	0.0408	0.0851	No
Assume t = 1; RMAX = 1	Intellectual capital investment (ICI)	Political Exposure	0.0192	0.0426	No
Assume t = 1; RMAX = 1	Intellectual capital investment (ICI)	Political Risk	0.0149	0.0391	No

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