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Article

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The interplay of economic policy uncertainty and corporate investment: analyzing the moderating influence of financial sector development in BRICS

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ABSTRACT

This study aims to examine the moderating effect of FSD on the relationship between EPU and corporate investment in the BRICS nations between 2010 and 2022. It looks at how a developed financial sector can lessen these effects and aims to offer empirical evidence on the mechanisms through which EPU influences corporate investment levels. Using a large dataset with 15,132 firm-year observations, this study uses system GMM panel EGLS and fixed effect models. The results show that corporate investment is considerably reduced by higher EPU levels, underscoring the detrimental effect of policy uncertainty on business investment choices. On the other hand, FSD has a positive moderating effect that protects against the damaging effects of EPU and encourages more corporate investment. To create an environment that is favorable for investment, the study emphasizes the significance of sound economic policies and a sophisticated financial sector. To improve investment resilience and economic growth, policymakers should give regulatory clarity and financial sector reforms top priority. By incorporating insights into how EPU and FSD interact to influence corporate investment behavior in emerging economies. It offers empirical data that broaden theoretical comprehension and has applications for stakeholders in the financial sector and policymakers.

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1. Introduction

In the complex and interrelated field of contemporary economics, a wide range of factors greatly impact corporate investment (CIN hereafter) decisions. Among other things, the widespread influence of economic policy uncertainty (henceforth referred to as EPU) on economic stability and growth has attracted a lot of interest from scholars and practitioners (Sood et al. 2024). The uncertainty and ambiguity surrounding government policies which can raise risk perceptions among businesses and investors are referred to as EPU. This unpredictability frequently results from political developments, legislative adjustments or geopolitical tensions that cloud the outlook for the economy going forward. An increased policy uncertainty can discourage CIN by making people more risk averse and encouraging businesses to take a wait-and-see stance. This cautious approach may cause investment projects to be delayed or scaled back which would impede innovation and economic growth (Lu et al. 2023). In summary from EPU's point of view a developed financial sector can significantly influence CIN choices. The expansion complexity and effectiveness of financial institutions and markets are all included in financial sector development or FSD for short. Effective financial systems lower transaction costs make credit easier to obtain and offer a strong foundation for risk management. As a result an advanced financial sector can lessen the negative effects of EPU by providing businesses with the resources and tools they need to deal with unpredictable situations.

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Corporate investment refers to the long-term capital expenditures that companies strategically allocate their resources toward in order to increase their competitiveness and productivity. This covers expenditures on infrastructure acquisitions and new machinery—all of which are essential for maintaining growth enhancing operational effectiveness and generating long-term profitability (Farooq et al., 2023). EPU is one important determinant in the CIN decision-making process which is heavily influenced by a variety of external factors. The uncertainty of governmental actions legislative changes fiscal policies and geopolitical events gives rise to EPU. A volatile business environment where companies struggle to predict future market conditions and possible returns on investment can result from such uncertainty. Because of this increased perception of risk businesses frequently take a cautious stance and postpone or scale back their investment activities in order to prevent possible losses (Xie et al., 2021). Strong banking systems dynamic capital markets easily accessible and effective credit markets and advanced risk management tools are just a few of the characteristics that define a well-developed financial sector. Together these components improve a company's capacity to obtain funding control financial risks and continue investing even in uncertain economic times (Wen et al., 2021). Businesses can access debt and equity financing for example and lessen their dependency on conventional bank loans which may be limited in uncertain times thanks to developed capital markets that offer a variety of financing options.

This study is motivated by the urgent need to comprehend the growing association between EPU and CIN particularly in a time of frequent economic disruptions, regulatory changes and geopolitical tensions. Businesses must navigate a more unstable global environment and the unpredictability of economic policies can significantly impact their investment choices possibly impeding innovation and growth. The understanding that EPU is an inevitable feature of contemporary economies but that the FSD can mitigate its negative effects on CIN is what motivates this study. Furthermore there is a need to fill a vacuum in the body of existing literature. Although EPU and its direct effects on CIN have been extensively studied (Akron et al., 2020; Dreyer & Schulz, 2023 Gupta et al., 2024; Xie et al., 2021), the moderating function of FSD is not as prominent. By examining the ways in which FSD affects the relationship between EPU and CIN, this study aims to offer insightful information that business executives and policymakers can use. Knowing this relationship can aid in the development of institutional frameworks and financial policies that promote long-term CIN even during uncertain times and increase economic resilience.

This study's objectives are to examine how EPU affects CIN and how FSD weakens this relationship. Fixed effects panel estimated generalized least square (EGLS) and system generalized methods of moments (GMM) models were used to obtain reliable insights from the analysis of non-financial sector businesses from 2010 to 2022. The results show that EPU significantly reduces CIN underscoring the difficulties that companies encounter in a policy environment that is unpredictable. In contrast FSD was shown to have a positive impact on CIN highlighting the importance of a sophisticated financial system in fostering company expansion. A robust financial sector can mitigate the negative effects of EPU on investment choices according to the analysis which also shows a positive moderating effect of FSD. In particular, firms are better able to manage risks and obtain credit in environments with developed financial sectors which allows them to keep investing even in the face of regulatory uncertainty. Bank financing has a positive correlation with CIN as access to external funding makes capital expenditure easier according to the results of additional control variables that were taken into account. Conversely, there is a negative correlation between investment activities and firm size and cash holdings indicating that larger companies and those with substantial cash reserves might take a more cautious approach to investing when faced with uncertainty. Together these observations highlight how important FSD is to creating a stable investment environment in the face of economic uncertainty.

This study clarifies the intricate relationship between EPU and CIN (corporate investment) decisions making which is significant theoretical contribution. The study expands on current investment theories especially those related to risk management and financial intermediation by incorporating the moderating function of FSD. Conventional theories like the q-theory of investment and real options theory emphasize how crucial market valuation and uncertainty are when making investment decisions. Some existing studies like (Akron et al., 2020; Bagow & Altaf, 2024; Chen et al., 2020; Hamza et al., 2024)

attempted to explore the nexus between EPU and CIN. However, there exist no study in literature that aimed to unveil the moderating role of FSD in EPU-CIN nexus. The analysis highlights that the FSD can help mitigating the adverse effects of EPU on CIN, thereby extending the literature. By showing that a strong financial sector can mitigate the negative effects of EPU and give businesses better access to credit and cutting-edge risk management tools our findings enhance these frameworks. This integration provides a more thorough theoretical framework that takes into consideration the dynamic interactions among CIN behavior financial sector maturity and policy uncertainty. This study contributes to the body of empirical research by providing solid multi-method evidence on how EPU and FSD affect CIN using fixed effects panel EGLS and system GMM models. The study provides nuanced insights into how these variables interact in various economic contexts by analyzing data from non-financial sector businesses from 2010 to 2022. While FSD not only encourages investment activities but also lessens the negative effects of policy uncertainty the empirical results unequivocally demonstrate that EPU has a negative impact on CIN. The significance of financial infrastructure in stabilizing investment activities in the face of economic uncertainty is highlighted by these empirical findings which add to the body of knowledge.

Practically, the study has important ramifications for business executives and policymakers. The study emphasizes the value of developing a strong financial infrastructure by highlighting the beneficial role that FSD plays in reducing the adverse effects of EPU. Using these insights, policymakers can create and execute financial reforms that ensure the stability of financial institutions improve risk management procedures and increase credit availability. In order to manage risks and continue investing during uncertain times, business leaders should use sophisticated financial instruments and interact with well-developed financial markets according to the findings. Furthermore knowing how different firm sizes and cash holdings affect investment behavior can help companies manage risk and allocate resources more effectively. All things considered this study makes practical suggestions that can contribute to creating a more robust economic climate that supports ongoing CIN and expansion.

The remainder of this paper is organized as follows: [Section 2](#) delineates the theoretical frameworks underpinning the study. [Section 3](#) offers a comprehensive review of the empirical literature and proposes the research hypotheses. [Section 4](#) outlines the data collection and methodological approaches employed to fulfill the study's objectives. [Section 5](#) presents the empirical results, which are subsequently analyzed and interpreted in [Section 6](#). Finally, [Section 7](#) synthesizes the overall discussion and elaborates on the policy implications of the findings.

2. Theoretical review

The underlying linkage between EPU, FSD, and CIN can be comprehended through the review of some prevailing theories, i.e. real options theory (Dixit & Pindyck, 1994) provides a framework for understanding investment decisions in the wake of uncertainty. According to this theory, firms view investment opportunities as options that can be exercised in the future. However, in the face of high EPU, the value of waiting increases as firms prefer to delay investment decisions until uncertainty resolves. This hesitation results in reduced CIN during periods of high EPU. However, FSD can mitigate this effect by offering better risk management tools and access to diverse financing options which reduce the perceived risk and cost of capital. By lowering the barriers and costs associated with uncertainty, a developed financial sector encourages firms to invest even amidst uncertain economic policies.

The q-theory of investment, articulated by James Tobin in 1969, posits that CIN decisions are influenced by the ratio of the market value of a firm's assets to their replacement cost, commonly referred to as Tobin's q. When Tobin's q is high, firms are more likely to invest as the market values their growth prospects favorably. EPU can negatively affect Tobin's q by increasing uncertainty about future cash flows and profitability, thereby reducing CIN. However, FSD can positively influence this relationship by providing firms with easier access to capital markets and reducing financing constraints. With better-developed financial systems, firms can maintain higher levels of investment even when EPU negatively affects market perceptions and valuations.

Similarly, according to the pecking order theory posited by Myers and Majluf (1984), firms exhibit a hierarchical preference in financing investments. They prioritize the utilization of internal funds, subsequently resorting to debt, and lastly, to equity issuance. This preference hierarchy is primarily attributed

to the costs incurred from asymmetric information. Under high EPU, firms might hoard cash to avoid the high costs and risks of external financing, leading to lower investment levels. However, a well-developed financial sector can alleviate the negative impact of EPU by reducing information asymmetries and lowering the cost of external financing. Financial institutions in developed markets provide better credit conditions and more reliable information, enabling firms to access external funds more easily and continue investing despite policy uncertainties.

Lastly, agency theory (Jensen & Meckling, 1976) focuses on the conflicts of interest between managers and shareholders which can be exacerbated under conditions of uncertainty. High EPU can lead to greater agency costs as managers may become more risk-averse, preferring to retain earnings rather than invest in potentially risky projects. This behavior results in lower CIN. FSD plays a crucial role in mitigating agency problems by improving transparency, governance, and monitoring mechanisms. In a well-developed financial sector, external investors and institutions can better oversee managerial actions, ensuring that firms do not unduly delay investment due to managerial risk aversion. Enhanced financial development thus helps align managers' actions with shareholders' interests, supporting sustained investment even during periods of high EPU.

These theories collectively highlight how FSD can moderate the negative effects of EPU on CIN. By providing better access to capital, sophisticated risk management tools, and improved governance, a developed financial sector enables firms to navigate uncertainty more effectively and maintain robust investment levels. Among the theories discussed, the real options theory appears to be the most relevant for explaining the linkage between EPU, FSD, and CIN. This theory is the most relevant for explaining the linkage between EPU, FSD, and CIN because it directly addresses the decision-making process under uncertainty and highlights the role of FSD in mitigating the negative effects of EPU. By providing a clear framework that incorporates both the challenges posed by uncertainty and the benefits of a robust financial sector, this theory offers a comprehensive explanation for the observed relationships in the study.

3. Empirical review

3.1. Economic policy uncertainty and corporate investment

The extant empirical literature elucidates the influence of EPU on CIN. For example, Chen et al. (2020) conducted an investigation into the impact of EPU on capital investment by firms listed on the Australian Stock Exchange (ASX). By replicating a US study, it finds that EPU has a long-lasting adverse impact on Australian firm's capital investment, particularly among resource and mining firms, highlighting the influence of industry-specific investment characteristics and real option theory. Ilyas et al. (2021) examined how oil price uncertainty (OPU) and EPU affect CIN by using data from 4017 global oil firms from 1991 to 2017. Through GLM regression with fixed effects and robust standard errors, the findings indicated that both OPU and EPU negatively influence CIN, especially in oil-producing countries, and this effect was consistent across various sub-samples and robustness tests. Hasan et al. (2022) explored the moderating role of investor protection in R&D investments and dividend payments nexus in the case of BRICS. The analysis advocated the negative nexus between R&D and cash dividends which was moderated by investor protection. Meng et al. (2023) investigated the impact of EPU on CIN in China, utilizing province-level EPU indices in conjunction with firm-level data sourced from the Annual Census of Industrial Enterprises. The study revealed that a 1% escalation in the EPU index corresponds to a 0.051% reduction in CIN. The analysis further identified that smaller, younger, less efficient, and financially vulnerable firms experience a more pronounced adverse effect from increased EPU.

Bagow and Altaf (2024) calculated how political uncertainty influences CIN in India, analyzing data from 771 non-financial firms between 2007 and 2020, including three general elections. They found that political uncertainty significantly reduces CINs, especially in tightly contested elections, while investments tend to increase post-election, with a stronger negative impact observed in politically sensitive industries and financially constrained firms. Das et al. (2024) empirically advocated that high EPU and inflation rates enhance the risk, thereby enhancing the cash holdings. In the wake of more EPU, enterprises stuck their funds which further can limit the flow of funds toward investment opportunities.

Gupta et al. (2024) explored the impact of EPU on the cash-flow sensitivity relating to investment (ICFS) of Indian manufacturing firms from 2004 to 2019 by using a fixed-effect method. The findings revealed that EPU increases ICFS, particularly during crisis periods, and affects smaller, younger, and standalone firms more than larger, mature, and business group-affiliated firms, while also reducing CIN. Hamza et al. (2024) inspected how EPU impacts the investment efficiency of French SMEs listed on the 'CAC Mid & Small' Index from 2008 to 2021. The study found that higher EPU reduces investment inefficiency in SMEs, particularly in competitive industries, by lowering both overinvestment and underinvestment tendencies.

Kurniawan et al. (2024) examines how government and EPU affects corporate risk-taking and financial reporting quality (FRQ) using a generalized least squares regression model on data from 27,376 company-year observations in eight Asia-Pacific countries. Their findings indicated that higher EPU significantly reduces investment activity and FRQ, highlighting the challenges faced by firms in developing countries during periods of macroeconomic instability. In view of literature analysis, it can be conjectured that

H₁: Economic policy uncertainty (EPU) is negatively related to corporate investment.

3.2. Financial sector development and investment

There is a dearth of literature exploring the role of FSD in determining corporate investment. However, some studies attempt to indirectly guide the FSD-investment nexus. For instance, Misati and Nyamongo (2011) employed panel data from 18 countries between 1991 and 2004 and examined the liaison between private investment and FSD in Sub-Saharan Africa. They found that high interest rates have a detrimental effect on private investment while institutional factors and credit availability play a major role in enhancing the investment. However, the influence of stock market development was limited on CIN. Naeem and Li (2019) analyzed a deranged panel dataset of non-financial enterprises in 35 OECD states over the period 1990 to 2015 to examine the impact of FSD on CIN efficiency. The results show that financial development positively influences investment efficiency, with significant improvements observed in both under- and over-investing firms, particularly in countries with high GDP growth rates.

Ehigiamusoe and Samsurijan (2021) studied how various factors influence the liaison between FSD and economic growth. They identified key variables such as institutional quality, macroeconomic stability, and levels of financial development and economic growth, showing that optimal conditions in these areas are crucial for leveraging financial development to enhance economic growth. Gong et al. (2023) explored how financialization impacts investment efficiency among listed nonfinancial firms in China (2011–2020). They found a positive correlation, particularly benefiting local state-owned enterprises (SOEs) and non-SOEs in eastern and central regions, by easing financing constraints. This shows that enhancing financing avenues and liquidity to optimize the financial sector's support for the real economy is vital. In view of these literature findings, it can be hypothesized that

H₂: The financial sector development is positively related to corporate investment.

3.3. Moderating impact

Numerous studies have highlighted the moderating role of financial sector development (FSD) in a range of economic and firm-level decisions. For instance, Wen et al. (2021) conducted an in-depth analysis of how government interventions within the industrial sector are strategically diversified, particularly scrutinizing the influence of environmental policies on investment decisions across various Asian economies during the period from 2007 to 2016. Using panel EGLS and two-step system GMM models, the findings indicated that carbon taxation negatively affects investment, while strategies like renewable energy utilization and green productivity enhance investment. Notably, they found that FSD moderates these effects and enhances the CIN. Liu et al. (2021) investigated the moderating influence of financial technology on the relationship between corporate social performance (CSP) and banking performance (BP)

within the context of Chinese banks, spanning the period from 2009 to 2018. The empirical results showed that fintech greatly increases nominal interest margin profit (NIMP) and return on equity (ROE). The impact of some CSR variables on financial performance varies but environmental and governance factors have a positive impact on ROA and ROE.

Almustafa et al. (2023) investigated how EPU impacts firm-level investment and financial leverage across 1072 publicly traded firms on NYSE, NYSE MKT, and NASDAQ from 2012 to 2021, employing a fixed-effect model. The outcomes disclose a significant adverse liaison between EPU and both corporate financial leverage and investment, robust across alternative variable measures. However, they found that financial leverage can moderate the effect of EPU on investment. A developed banking sector can offer more financial leverage, thereby reflecting the positive role of bank financing which is only possible through developed banking sector. Jumah et al. (2023) investigated the ways in which corporate diversification affects the connection between CIN and EPU. The study demonstrated using US firm-level data from 2000 to 2020 that diversification contributes to the reduction of financial constraints and consequently mitigates the adverse effect of EPU on investment. The findings were consistent across a range of tests. Based on the findings in the literature, it can be inferred that

H₃: Financial sector development moderates the relationship between EPU and corporate investment.

4. Data and methods

4.1. Data and sample

The empirical analysis of this study is based on a large dataset that includes 25389 firm-year observations from BRICS from 2010 to 2022. The dataset includes 1716 firm-year observations from Brazil, 533 from Russia, 9321 from India, 12285 from China and 1534 from South Africa among other countries in the sample. To ensure the robustness and reliability of the analysis a rigorous data screening process was implemented. Companies without data for any of the key variables were eliminated as part of this process to guarantee the accuracy of the statistical analysis. Additionally using common statistical techniques like z-scores and the interquartile range (IQR) method outlier values that could disproportionately affect the results and produce false conclusions were systematically found and eliminated. In other words businesses exhibiting values significantly outside of the typical range were excluded from the sample. The final sample consisted of 15132 firm-year observations after a thorough data screening process. Ultimately South Africa received 1492 firm-year observations, China 6024, India 5367, Russia 533, and Brazil 1716.

The rationale behind the sample and time period chosen for this research stems from the aim of gaining a thorough understanding of how CIN in emerging economies is affected FSD and EPU. In view of their varied economic structures, varied roles in the global economy, and varying stages of FSD, the BRICS countries were selected. Given that, these nations have had significant policy changes and economic growth in the last ten years, they offer a rich context for analyzing the interaction between EPU and FSD. Moreover, there have been both stable and turbulent economic times between 2010 and 2022, the time period provides a solid dataset that illustrates how CIN decisions are dynamic and responsive to shifting economic policies. The three notable websites named WDI (data on FSD), Policy Uncertainty Website¹ (data on EPU), and DataStream (data on firm specific variables) are credible financial databases from which the study's data were gathered.

4.2. Research equations and variables

The interplay among the variables may be articulated through the subsequent equations.

$$CIN_{it} = \alpha^{\circ} + \beta_1 CIN_{it-1} + \gamma_1 EPU_{it} + \delta_1 BFN_{it} + \delta_2 FRS_{it} + \delta_3 COH_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (1)$$

$$CIN_{it} = \alpha^{\circ} + \beta_1 CIN_{it-1} + \gamma_1 FSD_{it} + \delta_1 BFN_{it} + \delta_2 FRS_{it} + \delta_3 COH_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (2)$$

$$CIN_{it} = \alpha^0 + \beta_1 CIN_{it-1} + \gamma_1 EPU_{it} + \gamma_2 FSD_{it} + \gamma_3 EPU_{it} \times FSD_{it} + \delta_1 BFN_{it} + \delta_2 FRS_{it} + \delta_3 COH_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (3)$$

where CIN_{it} is the corporate investment for firm i at time t . CIN_{it-1} is the lagged CIN and EPU is the EPU. FSD is the financial sector development and $EPU_{it} \times FSD_{it}$ is the interaction term representing the moderating effect of financial sector development on the relationship between EPU and CIN. These equations include the control variables, i.e. BFN (bank financing), FRS (firm size), and COH (cash holdings). The symbols of μ_i and ρ_t represents unobserved firm-specific and time effects and ε_{it} is the error term. Defining the variables of study, CIN represents the spending by firms on capital assets such as buildings, machinery, and equipment. It is a vital aspect of a firm's strategic and operational planning, often quantified by the ratio of capital expenditures to total assets. This ratio shows how much of a company's total asset base is allocated to capital asset acquisition or maintenance. When it comes to long-term growth and operational efficiency, a company's capital expenditures (CapEx) are the money it uses to buy, renovate and maintain its physical assets which include buildings machinery and real estate. All of a company's possessions both current and non-current such as property plant and equipment are included in the total assets. Current assets include cash and inventory. Partially, capital expenditures from total assets yields the CIN ratio. As a measure of a company's investment activity, intensity in relation to its overall asset base this metric is important. A high ratio indicates that the company is concentrating on growth and expansion with a significant amount of its resources being allocated to capital assets (Akron et al., 2020; Chen et al., 2021; Farooq et al., 2023).

The EPU index quantifies uncertainty in economic policies by analyzing the frequency of related terms in newspapers and other publications. According to Baker et al. (2016), the EPU index is constructed to measure policy-related economic uncertainty using three main components: The initial component entails a comprehensive analysis of the frequency of articles published in prominent newspapers that incorporate terminology pertinent to economic conditions, uncertainty, and policy considerations. This includes identifying key words and phrases that signify discussions of EPU, such as 'uncertain economic policy', 'economic regulation', and 'monetary policy uncertainty'. The frequency of these articles is then aggregated to create an index that captures the public's perception of EPU over time. The second component considers the number of federal tax code provisions set to expire in future years. The rationale is that expiring tax provisions create uncertainty for businesses and households, as they are unsure about the future tax environment. A higher number of expiring provisions indicates greater uncertainty about future tax policies, contributing to overall EPU. The third component involves measuring the extent of disagreement among professional economic forecasters about future government purchases. This disagreement is quantified by examining the dispersion in forecasts for government spending. A higher dispersion indicates greater uncertainty about future fiscal policy, which can affect investment decisions by businesses. Some recent studies explored the linkage between EPU and CIN (Jing et al., 2023; Jumah et al., 2023; Lu et al., 2023).

Financial sector development refers to the growth and maturation of financial institutions and markets, enhancing the availability of financial services and facilitating efficient allocation of resources in the economy. It was measured by the availability of credit to the private sector, indicates the depth and maturity of a country's financial system. A well-developed financial sector can provide firms with the necessary capital to undertake investments, thus potentially mitigating the negative effects of EPU. By using this variable as a moderator, the study explores whether the presence of a robust financial sector can cushion firms against the adverse impacts of policy uncertainty on their investment decisions, highlighting the importance of financial infrastructure in economic resilience. Wen et al. (2021) considered the FSD as a cushion against environmental regulations while exploring its effect on CIN. Bank financing refers to the funds that firms borrow from banks to finance their operations, investments, and growth initiatives. It represents the extent to which firms rely on external debt for their capital needs. This variable is essential for understanding the financial leverage of firms and its impact on investment decisions. Firms with higher levels of bank financing may have different investment behaviors compared to those relying more on internal funds.

Firm size refers to the scale of a company's operations, measured by log of its total assets, indicating the company's market presence and resource base. Cash holdings refer to the liquid assets that a firm maintains to meet its immediate and short-term financial obligations and to finance investments

internally. Including these variables as control variables helps, isolate the effects of EPU and FSD on CIN. A list studies considered these variables as a determinant of CIN (Shiau et al., 2018; Sahoo & Bishnoi, 2023; Xie et al., 2021). Table 1 demonstrates the measurement of these variables.

4.3. Methodology

In this study, we estimate the regression models by considering three primary approaches: fixed effects, panel EGLS, and system GMM models. The selection of these models is rooted in their ability to handle various econometric issues that commonly arise in panel data analysis. Before applying these models, we conducted several pre-estimation techniques to diagnose potential econometric problems and ensure the robustness of our findings. These techniques included cross-section dependence (CD) analysis, endogeneity analysis, and heterogeneity analysis. The results of these analyses are reported in the subsequent tables. Table 2 presents the results of the CD analysis. It is a common issue in panel data, where residuals across different entities (e.g. firms or countries) may be correlated. To test for CD, we employed the Breusch-Pagan LM test (Breusch & Pagan, 1980), and the Pesaran CD tests (Pesaran, 2004). The results indicate significant CD for all the variables as evidenced by the highly significant p-values in both tests reported in Table 2. This implies that ignoring CD could lead to biased and inefficient estimates, necessitating the use of robust estimation techniques that account for such dependence. Endogeneity is another critical issue that can bias the results of regression models. To test for endogeneity, we performed the Wald test and assessed the restriction terms. The results are summarized in Table 3. The significant F-statistic and Chi-square values indicate the presence of endogeneity in the model. Furthermore, the significant restriction terms (C(1) through C(5)) confirm that endogeneity is a concern that must be addressed. This necessitates the use of techniques such as system GMM which can effectively handle endogeneity by using internal instruments to provide consistent estimates.

Heterogeneity across cross-sectional units is another important aspect to consider in panel data analysis. Table 4 shows the results of the Hausmann test (Hausmann, 1978) which was used for heterogeneity analysis. The significant Chi-square statistic in the heterogeneity test confirms the presence of heterogeneity across the cross-sectional units in the sample. This justifies the use of fixed effects models which can control for unobserved heterogeneity by allowing for individual-specific intercepts. In light of the pre-estimation analysis results, we use the fixed effect which permits individual-specific intercepts and accounts for unobserved heterogeneity. It is particularly useful when dealing with panel data that exhibit significant cross-sectional dependence and heterogeneity. Similarly, the EGLS model is used to handle CD and heteroskedasticity. This method provides more efficient estimates by correcting for potential cross-sectional and temporal dependencies in the data. The system GMM approach suggested by Arellano and Bover

Table 1. Variables of study.

Acronym	Variable	Measurement	Use as	Data source
CIN	Corporate investment	Capital expenditures/total assets	Dependent	EIKON/DataStream
EPU	Economic policy uncertainty index	EPU index	Independent	policyuncertainty.com/
FSD	Financial sector development	Domestic credit to private sector by banks (% of GDP)	Moderating	WDI
BFN	Bank financing	Bank loans/total assets	Control	EIKON/DataStream
FRS	Firm size	Log (total assets)	Control	EIKON/DataStream
COH	Cash holdings	Cash & cash equivalents/total assets	Control	EIKON/DataStream

Source: Previous studies.

Table 2. Cross-section dependence (CD) analysis.

Variables	Breusch-Pagan LM		Pesaran CD	
	Statistic	Probability	Statistic	Probability
CIN	305231.600	0.010	575.467	0.020
EPU	559.008	0.051	267.826	0.091
FSD	440915.900	0.000	286.113	0.021
BFN	154320.000	0.043	194.422	0.032
FRS	178.005	0.000	6.483	0.041
COH	602753.600	0.011	576.748	0.033

Table 3. Endogeneity analysis.

Test		Wald test	
Test statistic	Value	d.f.	Probability
F-statistic	3001.228	(5, 3745)	0.000
Chi-square	15006.140	5	0.000
Null hypothesis summary			
Normalized restriction (= 0)	Value	Std. Err.	
C(1)	−0.187	0.055	
C(2)	0.652	0.017	
C(3)	−1.920	0.003	
C(4)	0.025	0.012	
C(5)	0.034	0.006	

Note: the significant value of restriction terms (Cn) confirms the presence of endogeneity.

Table 4. Heterogeneity analysis.

Test summary	Chi-Sq. statistic	Chi-Sq. d.f	Prob
Cross-section random	935.235	5	0.000

Source: self-estimation.

Note: the significant value accepts the alternative hypothesis, i.e. fixed effect if appropriate.

(1995) is employed to address endogeneity. This dynamic panel data estimation technique uses internal instruments to correct for potential biases arising from endogenous regressors. System GMM is particularly effective in dealing with panel data that exhibit both endogeneity and dynamic relationships.

By applying these models, we aim to provide robust and reliable estimates of the impact of EPU and FSD on CIN, while controlling for other relevant factors such as bank financing, firm size, and cash holdings. The combination of these methodologies ensures that our findings are not only statistically robust but also reflective of the complex economic dynamics influencing CIN decisions. These methodologies were also adopted by the recent studies conducted on similar theme of research (Farooq et al., 2023; Wen et al., 2021).

5. Empirical analysis

5.1. Descriptive analysis

Table 5 delineates the descriptive statistics pertinent to the variables examined in the study, providing a comprehensive overview of their central tendencies and measures of dispersion. The mean value of CIN is 0.297, indicating that, on average, firms allocate approximately 29.7% of their total assets towards capital expenditures. The EPU index has a mean value of 119.421, suggesting a relatively high level of policy-related economic uncertainty over the sample period. The mean value for FSD is 78.305, reflecting the average percentage of domestic credit to the private sector by banks relative to GDP, which illustrates the development level of the financial sector within the sample countries. Bank financing (BFN) has a mean of 0.277, meaning that, on average, 27.7% of firms' total assets are financed through bank loans. The average FRS is 7.965, indicating a moderate size for firms in the sample. Cash holdings (COH) exhibit a mean value of 0.128, showing that, on average, firms hold 12.8% of their total assets in cash and cash equivalents. These mean values provide a snapshot of the general trends and levels for each variable, highlighting the relative proportions and economic conditions experienced by the firms within the sample period.

5.2. Correlation analysis

The correlation values in Table 6 reveal important relationships between the variables under study. EPU is negatively correlated with CIN with a coefficient of -0.042, suggesting that higher EPU is associated with slightly lower levels of CIN, although the correlation is relatively weak. The correlation between FSD and CIN is 0.096, indicating a modest positive relationship, where FSD is associated with an increase in CIN. Bank financing (BFN) shows a positive correlation with CIN, with a coefficient of 0.197, indicating that

Table 5. Descriptive statistics.

Variables	Mean	Median	Maximum	Minimum	Std. Dev	Skewness	Kurtosis
CIN	0.297	0.244	0.908	0.010	0.256	0.528	2.051
EPU	119.421	104.555	363.358	35.566	73.561	1.519	5.132
FSD	78.305	61.422	186.207	41.695	40.693	1.506	3.677
BFN	0.277	0.260	0.905	0.010	0.194	0.607	2.916
FRS	7.965	7.864	10.728	5.371	0.945	0.337	2.574
COH	0.128	0.097	0.900	0.010	0.117	2.317	4.688

Table 6. Correlation statistics.

Variables	CIN	EPU	FSD	BFN	FRS	COH
CIN	1.000					
EPU	-0.042 ^a	1.000				
FSD	0.096 ^a	0.202 ^b	1.000			
BFN	0.197 ^b	0.124 ^c	-0.003 ^a	1.000		
FRS	-0.049 ^a	0.097 ^a	0.069 ^b	0.049 ^a	1.000	
COH	-0.251 ^c	0.120 ^a	0.214 ^a	-0.160 ^a	-0.102 ^a	1.000

Note: the superscripts a, b, and c show the significance level at 1%, 5%, and 10%, respectively.

greater bank financing is associated with higher levels of CIN. Firm size (FRS) has a slightly negative correlation with CIN, with a coefficient of -0.049, implying that larger firms tend to invest a bit less relative to their total assets, although this relationship is not particularly strong. Lastly, cash holdings (COH) exhibit a negative correlation with CIN, with a coefficient of -0.251, indicating a stronger negative relationship compared to the other variables. This suggests that firms holding more cash and cash equivalents tend to invest less in capital expenditures. These correlations provide a preliminary understanding of the interrelationships among the key variables and highlight potential areas for deeper analysis in the study.

5.3. Regression analysis

The regression Tables 7–9 present the coefficients from various regression models used to analyze the effects of EPU and FSD on corporate investment (CIN). In this context, the system GMM is a particularly robust model as it addresses issues of endogeneity, unobserved heterogeneity, and dynamic panel bias. Table 7 shows the effect of EPU on CIN.

The coefficient for EPU is -0.019 and is statistically significant at the 1% level. This finding suggests a negative relationship, indicating that increased levels of EPU are associated with diminished CIN levels. This negative relationship aligns with the theory that uncertainty regarding economic policy can discourage firms from making long-term investments. For control variables, BFN has a positive and significant coefficient of 0.025, suggesting that increased bank loans positively impact CIN. Firm size (FRS) has a negative coefficient of -0.034, implying that larger firms tend to invest less in relation to their total assets. Cash holdings (COH) has a marginally significant positive coefficient of 0.050, indicating a slight positive relationship with CIN in the System GMM model.

Table 8 focuses on the effect of FSD on CIN. A more sophisticated financial sector exerts a beneficial influence on CIN, as evidenced by a FSD coefficient of 0.048, which attains statistical significance at the one percent level. The idea that improved access to credit and financial services through a well-developed financial sector facilitates investment activities is supported by this outcome. Table 9 looks at how FSD moderates the relationship between CIN and EPU. With an EPU coefficient of -0.006, which is significant at the 1 percent level CIN, is negatively correlated. A positive coefficient of 0.012 significant at the 1 percent level is found in the interaction term (EPU*FSD) indicating that FSD attenuates the detrimental effect of EPU on CIN. This result emphasizes how crucial a healthy financial sector is for mitigating the negative effects of uncertainty on investment choices.

6. Discussion on results

The analysis reveals that EPU hampers the corporate investment. This can be explained as EPU hampers CIN by creating an environment of unpredictability and risk, which discourages firms from committing

Table 7. Effect of EPU on corporate investment.

Variables	Corporate investment					
	Fixed effect		Panel EGLS		System GMM	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
C	0.403 ^a	0.000	0.465 ^a	0.000	−0.187 ^a	0.000
CIN(-1)	—	—	—	—	0.652 ^a	0.000
EPU	−0.004 ^a	0.005	−0.001 ^a	0.000	−0.019 ^a	0.045
BFN	0.126 ^a	0.000	0.248 ^a	0.000	0.025 ^a	0.045
FRS	−0.011 ^a	0.012	−0.021 ^a	0.000	−0.034 ^a	0.000
COH	−0.316 ^a	0.000	−0.462 ^a	0.000	−0.050 ^b	0.067
Adjusted R-square		0.621		0.411		0.667
S.E. of regression		0.062		0.243		0.045
Hansen test		—		—		0.147
AR (2)		—		—		0.188

Source: self-estimation.

Table 8. Effect of FSD on corporate investment.

Variables	Corporate investment					
	Fixed effect		Panel EGLS		System GMM	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
C	0.369 ^a	0.000	0.498 ^a	0.000	0.020 ^b	0.061
CIN(-1)	—	—	—	—	0.662 ^a	0.000
FSD	0.058 ^a	0.000	0.049 ^a	0.000	0.048 ^a	0.000
BFN	0.126 ^a	0.000	0.250 ^a	0.000	0.021 ^c	0.093
FRS	−0.251	0.619	−0.023 ^a	0.000	−0.013 ^a	0.012
COH	−0.316 ^a	0.000	−0.426 ^a	0.000	0.031	0.246
Adjusted R-square		0.427		0.427		0.417
S.E. of regression		0.069		0.214		0.049
Hansen test		—		—		0.187
AR (2)		—		—		0.253

Source: self-estimation.

Table 9. Moderating effect of FSD in EPU-CIN Nexus.

Variables	Corporate investment					
	Fixed effect		Panel EGLS		System GMM	
	Coefficient	Probability	Coefficient	Probability	Coeff	Prob
C	0.362 ^a	0.000	0.499 ^a	0.000	0.016 ^b	0.067
CIN(-1)	—	—	—	—	0.660 ^a	0.000
EPU	−0.020 ^a	0.008	−0.028 ^a	0.041	−0.026 ^a	0.019
FSD	0.066 ^a	0.000	0.049 ^a	0.000	0.052 ^a	0.000
EPU*FSD	0.011 ^a	0.013	0.013 ^b	0.074	0.012 ^a	0.013
BFN	0.125 ^a	0.000	0.254 ^a	0.000	0.021 ^b	0.088
FRS	−0.004	0.992	−0.022 ^a	0.000	−0.014 ^a	0.006
COH	−0.315 ^a	0.000	−0.421 ^a	0.000	−0.032	0.245
Adjusted R-square		0.422		0.423		0.667
S.E. of regression		0.068		0.241		0.045
Hansen test		—		—		0.147
AR (2)		—		—		0.292

Source: self-estimation.

to long-term capital expenditures. When economic policies are uncertain, businesses face difficulties in forecasting future costs, demand, and regulatory conditions, leading to an increased uncertainty about the returns on investment. This hesitation is often reflected in delayed or reduced investment in new projects, expansion, and innovation. Firms may adopt a wait-and-see approach, conserving cash and maintaining liquidity instead of investing in potentially profitable ventures. The negative impact of EPU on investment is further exacerbated when firms cannot accurately predict government actions, such as tax policies, trade regulations, or fiscal measures, which directly affect their operating environment. Consequently, high levels of EPU can result in a significant decline in CIN, stalling economic growth and innovation within the economy. This negative effect of EPU on CIN aligned with the findings of existing literature (Akron et al., 2020; Dreyer & Schulz, 2023; Lu et al., 2023).

In contrast, we find the positive effect of FSD on CIN. Financial sector development (FSD) enhances CIN by providing firms with improved access to financial resources, reducing the cost of capital, and

offering a more efficient allocation of financial resources. A well-developed financial sector includes a diverse range of financial institutions, markets, and instruments that facilitate the mobilization and allocation of funds. This infrastructure allows firms to secure the necessary capital for investment in new projects, research and development, and expansion activities. Additionally, a robust financial sector reduces information asymmetries and transaction costs, making it easier for firms to access credit and other financial services. It also promotes better risk management through diversified financial products and services, enabling firms to hedge against uncertainties. As a result, businesses are more likely to undertake investment activities when they have confidence in the availability and reliability of financial resources, ultimately leading to higher levels of CIN and contributing to economic growth and development. We found no study exploring the direct impact of FSD on CIN. However, the study of Gong et al. (2023) conjectured the similar impact of financialization on CIN.

The findings further reveal that FSD moderates the negative impact of EPU on CIN by providing firms with the financial stability and resources needed to navigate uncertain economic environments. In times of high EPU, firms face increased risks and uncertainties that can deter investment. However, a well-developed financial sector can alleviate these concerns by offering diverse financial instruments, efficient credit allocation, and risk management tools. For instance, access to reliable credit and financial services enables firms to maintain liquidity and continue their investment activities despite the uncertainties posed by shifting economic policies. Moreover, FSD enhances information flow and reduces transaction costs, allowing firms to make more informed investment decisions even when policy directions are unclear. By providing a buffer against the volatility associated with EPU, a strong financial sector helps sustain CIN levels, ensuring that firms remain proactive and growth-oriented despite economic policy uncertainties. In literature, no study explored the moderating role of FSD in EPU-investment nexus. However, the analysis of Wen et al. (2021) highlights the similar impact of FSD in the case of environmental regulations-investment nexus. Leaning on this, it can be conjectured that FSD can alienates the adverse effects of EPU on investment.

Bank financing positively affects CIN by providing firms with the necessary capital to undertake new projects, expand operations, and innovate. Access to bank loans enables companies to fund capital expenditures without depleting their internal resources, facilitating growth and development. Conversely, firm size negatively impacts CIN, as larger firms often face diminishing marginal returns on new investments and may have already achieved significant economies of scale. This can lead to a more conservative investment approach. Similarly, high cash holdings negatively affect CIN, as firms with substantial liquidity might prefer to hold onto their cash for security against future uncertainties rather than investing it. This behavior is often driven by risk aversion and a desire to maintain financial flexibility, leading to reduced levels of capital expenditures (Sahoo & Bishnoi, 2023).

7. Conclusion and policies

Using a large dataset covering the BRICS nations from 2010 to 2022, the study investigated the complex relationship between EPU, FSD and CIN. A number of important insights are revealed by using strong econometric models such as fixed effect panel EGLS and system GMM. First off CIN is consistently negatively impacted by EPU suggesting that firms are deterred from making long-term capital expenditures by higher levels of policy uncertainty. This emphasizes how crucial stable economic policies are to creating an atmosphere that is favorable for investment. Second FSD is essential for encouraging CIN. A robust financial sector lowers the cost of capital makes it easier for businesses to allocate credit effectively and increases firms access to financial resources—all of which promote investment activity. Furthermore FSD plays a key moderating role in the EPU-CIN relationship in addition to having a direct positive impact on CIN. By giving businesses the resources and financial stability they require to negotiate unstable economic conditions it lessens the negative effects of EPU on investment. This emphasizes how important a strong financial sector is for maintaining investment levels and acting as a buffer against changes in economic policy. The study makes several contributions. In theory it expands and unifies our knowledge of how FSD and EPU interact to affect CIN. It offers solid empirical support from a sizable and varied sample guaranteeing the findings generalizability. From a practical standpoint the insights provide significant implications for stakeholders in the financial sector and policymakers highlighting the necessity of stable economic policies and a developed financial sector to promote an investment-friendly environment.

7.1. Policy outputs

For governments and financial sector regulators in the BRICS nations and elsewhere, the study's conclusions have a number of significant policy ramifications. Policymakers must work toward greater economic and regulatory stability in light of EPU's detrimental effects on CIN. Governments should implement economic policies that are predictable consistent and clear in order to reduce policy uncertainty. Clear communication and well-designed regulatory frameworks can greatly lessen the uncertainty that prevents businesses from investing for the long run. Governments can establish conducive conditions for long-term corporate investment (CIN) and economic expansion by cultivating a stable policy environment. Nonetheless the research emphasizes how important FSD is for encouraging CIN. Policymakers ought to give top priority to reforms that improve the financial sectors depth effectiveness and stability. This entails developing competitive financial markets increasing credit availability and fortifying financial institutions. By making financial resources more accessible and affordable governments can help businesses get over capital constraints and promote more investment in profitable ventures. And encouraging financial inclusion and literacy can guarantee a wider variety of businesses.

Moreover, the moderating effect of FSD on the relationship between EPU and CIN suggests that a well-developed financial sector can act as a buffer against economic policy uncertainties. Policymakers should focus on building a resilient financial infrastructure that can withstand economic shocks and provide stability during periods of uncertainty. This involves not only regulatory reforms but also the development of innovative financial instruments and risk management tools that can help firms navigate uncertain economic conditions. Strengthening the financial sector's capacity to support firms during times of policy uncertainty can mitigate the negative impact on investment and sustain economic growth. Additionally, the positive impact of bank financing on CIN highlights the importance of ensuring a robust banking sector. Policymakers should encourage banks to extend credit to businesses, particularly in sectors with high growth potential. This can be achieved through regulatory measures that promote lending, such as favorable interest rate policies, reduced collateral requirements, and targeted credit programs. By facilitating access to bank financing, governments can support firms in undertaking new projects and expanding their operations, thereby driving overall economic development.

Last but not least, the inverse correlations found between CIN cash holdings and firm size imply that more conservative investment strategies may be adopted by larger and cash-rich firms. Legislators ought to think about providing incentives that motivate these businesses to put their earnings and extra money back into worthwhile endeavors. Companies can be encouraged to make better use of their resources by offering tax breaks for capital expenditures grants for R&D and subsidies for creative projects. Greater capital formation innovation and job creation can result from encouraging larger companies to reinvest their profits all of which support long-term economic growth. To sum up the study's conclusions highlight the necessity of sound financial sector development consistent and stable economic policies and targeted incentives to boost CIN.

7.2. Limitations and future research

Despite the robust findings and significant contributions of this study, several limitations must be acknowledged which also present avenues for future research. The research considers exclusively on BRICS states, which, while providing valuable insights into these emerging economies, may limit the generalizability of the findings to other regions. Future research could expand the geographical scope to include a more diverse set of countries, both developed and developing, to examine whether the observed relationships hold in different economic contexts. This would enhance the understanding of how EPU and FSD interact to influence CIN globally. Additionally, the study primarily examines the direct and moderating effects of FSD and does not delve deeply into the specific mechanisms through which financial sector development influences CIN. Future research could investigate these mechanisms in greater detail, such as the roles of different types of financial institutions (e.g. banks versus non-bank financial intermediaries), the impact of financial innovation, and the effectiveness of specific financial products and services in promoting investment. Furthermore, the control variables included in this study, such as bank financing, firm size, and cash holdings, provide a snapshot of factors influencing CIN. However, other potentially important factors, such as corporate governance, management practices, market competition, and macroeconomic conditions, were not considered. Future research could incorporate a broader set of variables to provide a more comprehensive analysis of the determinants of CIN.

Lastly, the study spans the period from 2010 to 2022, capturing significant economic events, including the global financial crisis and the COVID-19 pandemic. While this period provides rich data for analysis, it also includes extraordinary events that might skew the results. Future studies could extend the analysis to more recent years or conduct sub-period analyses to isolate the effects of such events and provide a clearer picture of the long-term trends and relationships.

Note

1. <https://www.policyuncertainty.com/>.

Disclosure statement

We hereby confirm that we have no conflict of interest.

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Data availability statement

Data that support the findings of study are available on DataStream and policy uncertainty websites. Data will be made available on request.

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