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Dancing with Uncertainty: Unraveling Firm Investment Inefficiencies in the Asia Pacific Region

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A B S T R A C T

This study explores the intricate relationship between uncertainty and corporate investment inefficiencies in the Asia-Pacific region, utilizing data from non-financial firms between 2008 and 2021. The method used in the study is fixed effect regression with Driscoll-Kraay robust standard error. The empirical analysis unveils that uncertainty leads to overinvestment. This phenomenon is more pronounced in middle and low-income economies, while high-income countries display a distinct trend of less susceptibility to uncertainty-induced suboptimal investment choices. The study's implications extend to policymakers and industry stakeholders, urging a closer examination of firms' risk management strategies, particularly considering the strategic potential of overinvestment as a buffer against uncertainty's adverse effects. This holds particular significance in the dynamic economic landscape of the Asia-Pacific countries, where the study contributes to a deeper understanding of the interplay between uncertainty and inefficiency of investment decisions across diverse economic settings.

A B S T R A K

Studi ini mengobservasi hubungan antara ketidakpastian dan inefisiensi investasi perusahaan di negara Asia-Pasifik, dengan menggunakan data dari perusahaan non-keuangan antara tahun 2008 hingga 2021. Metode yang digunakan adalah fixed effect regression with Driscoll-kraay robust standard error. Analisis empiris menemukan bahwa ketidakpastian menyebabkan investasi yang berlebih. Fenomena ini lebih terlihat di negara dengan ekonomi berpenghasilan menengah dan rendah, sementara negara-negara berpenghasilan tinggi menunjukkan tren yang berbeda dengan pengaruh ketidakpastian yang lebih rendah terhadap pilihan investasi suboptimal. Implikasi studi ini dapat ditujukan kepada pembuat kebijakan dan pemangku kepentingan industri, mendorong pemeriksaan lebih mendalam terhadap strategi manajemen risiko perusahaan, terutama mengingat potensi strategis investasi berlebih sebagai pelindung terhadap dari ketidakpastian. Hal ini terutama untuk dalam ekonomi dinamis seperti negara Asia-Pasifik, di mana studi ini berkontribusi pada pemahaman yang lebih dalam tentang interaksi antara ketidakpastian dan inefisiensi keputusan investasi di berbagai pengaturan ekonomi.

1. INTRODUCTION

For a company to expand and thrive, it needs to invest in its growth opportunities by allocating capital to productive assets. These expenditures and projects impact a firm's profitability, economic operational activity, and growth potential (Wang et al., 2016). While making investment decisions might seem straightforward in a perfect world with complete information, the reality is quite different due to imperfect information or uncertain conditions. Uncertainty causes economic agents such as managers to navigate through multiple

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probabilities without achieving a certain outlook on future outcomes. This study aims to observe whether uncertainty contributes to inefficient corporate investment decisions.

The concept of uncertainty is elusive; it is unobservable, and many efforts have been made to define and measure it. Specifically, in this research, uncertainty is defined as a condition when decision-makers have limited information available, impacting their confidence in the quality of information and their ability to comprehend it (Popp & Zhang, 2016). Furthermore, some researchers have shown progress in unveiling the term uncertainty. This progress includes efforts to develop methods for quantifying uncertainty (Ahir et al., 2022; Jurado et al., 2015; Ludvigson et al., 2021; Ozturk & Sheng, 2018). This research utilizes the world uncertainty index developed by Ahir et al. (2022) to study how uncertainty affects a firm's investment inefficiency.

Prior studies have emphasized the importance of uncertainty in corporate decision-making. According to Chan et al. (2021), Drobetz et al. (2018), and Li et al. (2018), uncertainty heightens the cost of obtaining external equity capital due to an increased risk premium. Pan et al. (2019) revealed empirical evidence suggesting that firms adjust their long-term debt maturity ratios during periods of elevated economic policy uncertainty, indicating a strategic response to reduce financial distress. Additionally, Schwarz & Dalmácio (2021) discovered that Brazilian firms tend to increase their leverage ratios amidst rising economic policy uncertainty.

A multitude of studies have been carried out to examine the impact of uncertainty on corporate investment. Neamtiu et al. (2014) demonstrated that managers opt to retain their cash when uncertainty diminishes the value of a firm's investment opportunities value, leading to the preservation of investments. Additionally, Gulen & Ion (2016) explained that firms tend to reduce their investment during periods of high economic policy uncertainty, particularly when the level of investment irreversibility is high. Overall, previous research (Akron et al., 2020; Chen et al., 2020; Drobetz et al., 2018; Suh & Yang, 2021) agreed that uncertainty does impact investment decisions. Yet, the question of whether uncertainty leads to efficient investments remains scarcely addressed.

Uncertainty disrupts information flow in the market, resulting in a higher gap of information asymmetry between managers and investors. Escalating information asymmetry intensifies the cost of information acquisition, consequently elevating the cost of capital (Chan et al., 2021; Drobetz et al., 2018; Li et al., 2018). Consequently, firms encounter challenges in pursuing investment opportunities and may grapple with underinvestment problems (Akron et al., 2022). However, managers might exploit this information asymmetry to make more investments due to a lack of monitoring, potentially leading to overinvestment (Akron et al., 2020). Additionally, Im et al. (2022) also indicated that firms seek certainty by emulating their peers' investment choices during periods of uncertainty, which might not always yield optimal decisions. This study aims to explore further whether uncertainty forces firms to make any suboptimal investment, particularly in Asia-Pacific region countries.

In today's interconnected and rapidly evolving global economy, effective investment decisions are important to maintaining competitiveness and sustaining growth (Tran, 2021). The complexities of this decision-making process are magnified by the presence of uncertainty, a phenomenon that firms must grapple with. While uncertainty is inevitable in the business landscape, understanding its impact on investment inefficiencies is important. The evolving dynamics of markets, technological advancements, and shifts in geopolitical landscapes constantly introduce new sources of uncertainty. Based on the IMF report (IMF, 2023), Asian countries are attracting foreign investors due to their remarkable growth rates. In these dynamic conditions, insights into the interplay between uncertainty and investment inefficiencies are crucial. This study endeavors to illuminate insights that guide firms in making well-informed, optimal investment choices, particularly within the dynamic context of Asia-Pacific countries. Furthermore, amidst the rapid growth and inherent volatility of Asian economies, previous research explores the intricate relationship between these economies and firms' investment strategies (Majeed et al., 2018; Wang et al., 2016). This study contributes to the existing literature by addressing a crucial research gap concerning the impact of uncertainty on investment inefficiencies, particularly in the context of Asia-Pacific countries. While prior studies acknowledge the influence of uncertainty on corporate investment decisions, the question of whether uncertainty leads to efficient investments remains inadequately explored. The study seeks to investigate whether firms, especially in Asia-Pacific countries, are forced to make suboptimal investment choices amid uncertainty. By under-

standing the relationship between uncertainty and investment inefficiencies, this study aims to provide insights that can aid firms in making informed and optimal investment choices, particularly within the context of Asia-Pacific countries.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

2.1. Uncertainty

Within the field of management studies, there is a lack of a clear slate as to the meaning of uncertainty. Uncertainty is any deviation from the achievable outcome forecasted (Al-Thaqeb & Algharabali, 2019). Even with adequate knowledge, uncertainty still exists. Thus making it hard for us to grasp the concept of uncertainty. Baker et al. (2016) developed an index that measures Economic Policy Uncertainty (EPU) by covering newspaper frequency of several keywords such as uncertain, uncertainty, economic, federal reserves, and others. Then, they compared the frequency of these keywords in certain situations. They found that these keywords are found more in times such as presidential elections, the 9-11 incident, World War I and II, the 2011 debt ceiling problem, and so on. Therefore, it gives us a foothold in measuring uncertainty. Following the EPU index, Ahir et al. (2022) further expanded this notion by constructing the World Uncertainty Index (WUI), which quantifies uncertainty by analyzing words like "uncertain" and "uncertainty" within the Economist Intelligence Unit (EIU) country reports. The WUI covers a larger dataset than the EPU index, which covers mostly developed countries.

Uncertainty can influence decision-making done by businesses, policymakers, or even households. Uncertainty has been found to affect export activity in a country (Liao et al., 2022). Christou et al. (2020) and Viorica et al. (2014) found that uncertainty can affect macroeconomic variables such as the inflation rate, unemployment rate, monetary policy rate, and nominal exchange rate. The higher uncertainty results in a decrease in interest rate, dollar pound exchange rate, and an increase in the unemployment rate.

Furthermore, previous studies also found the impact of uncertainty on firms' policies. Due to an increase in information asymmetry, uncertainty increases the firm's cost of capital (Iania et al., 2023; Li et al., 2018). Lee et al. (2019) studied the fact that uncertainty causes a negative impact on a company's stock gains. New information added to the stock market representing uncertainty made the stock prices more volatile and caused investors to demand more returns. In addition, previous research (Pan et al., 2019) also found that uncertainty affects firms' decisions on their capital structure. Uncertainty increases the cost of capital and the risk of bankruptcy. Thus, firms would want to adjust their capital structure. Furthermore, Neamtiu et al. (2014) revealed that uncertainty increases a firm's cash holdings. They argue that in the presence of uncertainty, risk-averse individuals tend to assume the worst possible outcome for each situation. It has an impact on the reservation price of potential projects or investments. Therefore, companies prefer to hold more cash holdings than to make investments. Additionally, Breuer et al. (2017) documented that companies also prefer to decrease their dividends to hold a more defensive position or cut down on share repurchases with the goal of hoarding cash for future investment opportunities.

Specifically, numerous studies also show that uncertainty can affect corporate investment decisions (Akron et al., 2020; Chen et al., 2020; Drobetz et al., 2018; Suh & Yang, 2021). Neamtiu et al. (2014) demonstrated that managers tend to preserve their cash holdings as uncertainty diminishes the firm's investment opportunities value, leading them to opt for holding their investment instead. Moreover, Gulen & Ion (2016) explained that firms tend to reduce their investment during periods of high economic policy. This effect is even more pronounced when there is a high degree of investment irreversibility. In conclusion, uncertainty is one of the important factors that determine firms' investment decisions.

2.2. Investment Inefficiency: Underinvestment and Overinvestment

Investment inefficiency is a significant subject of interest in the field of corporate finance. Investment inefficiency is the condition when a firm's investment deviates from its optimal investment. Underinvestment and overinvestment are two forms of suboptimal investment. Underinvestment occurs when firms choose not to pursue their positive NPV project. Khaw & Lee (2016) argued that firms opt to let go of their investment opportunities when they face high external financing costs and insufficient internal financing. The importance of cost-effective growth and sustained competitiveness highlights the necessity for firms to find a

balance between financing and investment options, ensuring they do not forfeit value-enhancing opportunities. Firms need to make strategic decisions regarding their capital structure to ensure they do not delay the pursuit of growth opportunities (El Ghoul et al., 2023).

On the other hand, overinvestment involves managers engaging in high-risk projects with negative NPV, often driven by motives beyond financial rationale. This tendency can be linked to a phenomenon known as empire building, where managers seek to expand their influence footprint through ambitious yet unwarranted investments. The interplay between high cash flow and limited growth opportunities highlights the dynamics of overinvestment, with firms sometimes misallocating internal funds into ventures that fail to generate comparable returns (Senga, 2015). Availability of cash flow with "cheap" cost of capital drives management incentive to wasteful investment spending.

Previous research predominantly shows that investment inefficiencies are closely related to the agency problem and explores various corporate governance elements such as auditor traits (Elaoud & Jarboui, 2017), managerial traits (Faccio et al., 2016; He et al., 2019), ownership structure (Cao et al., 2018), and executive compensation (Navissi et al., 2017). These studies collectively shed light on how governance mechanisms impact investment decisions, either amplifying or mitigating the tendencies toward underinvestment or overinvestment.

2.3. Hypothesis Development

Firms need to make efficient investment decisions since they directly impact the firm's value and shareholders' wealth. To achieve efficient investment, firms require a comprehensive set of information. However, in this imperfect world, the presence of uncertainty makes it challenging to obtain a perfect set of information. Chen et al. (2020) showed that uncertainty causes a decrease in corporate investment. The acquisition of information becomes more challenging during periods of heightened uncertainty, pushing managers to adopt a wait-and-see approach until the uncertainty subsides, leading to the delay of investment opportunities. Furthermore, imperfect information diminishes the precision of estimates made by both managers and investors. Uncertainty raises economic agents' ambiguity aversion, pushing them to adopt a cautious approach and take on the worst outcome of the project. Uncertainty increases the option value to delay firms' investment and even let go of their investment opportunities (Neamtiu et al., 2014).

Previous research shows that uncertainty can affect corporate investment through various channels, such as investment irreversibility level (Gulen & Ion, 2016), asset deployability (Kim & Kung, 2017), managerial incentives (Glover & Levine, 2015), cost of capital (Drobetz et al., 2018; Waisman et al., 2015), peer investment (Im et al., 2021), and the value of investment opportunities (Neamtiu et al., 2014). Moreover, there are also some studies (e.g., Segal et al., 2015) that showed that uncertainty can increase corporate investment. Wang et al. (2016) explained that overconfident managers may decide to invest as a strategic signal to external investors regarding the firm's prospective financial position in the future. However, it is vital to note that this surge in investment during high uncertainty periods doesn't necessarily translate to enhanced revenue outcomes; in fact, it can expose firms to financial losses in worst-case scenarios.

Although the relationship between uncertainty and investment has been vastly discussed, this study aims to see further whether uncertainty will cause firms to make inefficient investment decisions. This research defines inefficient investment as a condition when firms invest more or less than the optimal level determined by their underlying investment opportunity (Guariglia & Yang, 2016). Such inefficiencies result in the misallocation of valuable resources, manifested either through excessive investment in projects resulting in low returns or insufficient investment in ventures with substantial growth potential. As a result, this study posits the following hypothesis:

H1. Uncertainty increases firms' investment inefficiency.

Uncertainty increases informational problems in the market. Managers might devalue the information they obtain and face heightened ambiguity problems (Viviani et al., 2018). Moreover, investors and external financing funders also face difficulties in finding information for valuations, and it is harder for them to make investment decisions (Akron et al., 2022; Duong et al., 2020). As a result, external investors demand higher returns during high-uncertainty periods (Chan et al., 2021), thereby elevating the cost of capital. In other words, firms encounter higher financial friction, which can lead to making decisions to invest in potential opportunities. Thus, the second hypothesis is as follows:

H2. Uncertainty increases firms' underinvestment.

During high uncertainty periods, the information asymmetry between managers and external investors is heightened, giving rise to a dynamic where the information gap widens (Al-Thaqeb & Algharabali, 2019). This informational gap between managers and outside investors highlights a pivotal challenge. Managers may largely exploit this asymmetry by making suboptimal investment decisions. By capitalizing on their superior insights, managers can make their investment decisions to maximize their perceived benefits (Wang et al., 2016). Managers recognize that external stakeholders, armed with limited information, may interpret uncertainty as a signal of heightened risk (Shi, 2019). They may identify opportunities that, despite their inherent uncertainty, hold the potential for significant payoffs. This, in turn, can lead to a skewed valuation of investment opportunities. To counteract this skewed perception, managers may strategically choose to invest in projects they believe are undervalued due to the prevailing uncertainty (Irawan & Okimoto, 2021). By capitalizing on the gap in the information, they can potentially access valuable investment opportunities at favorable terms. Moreover, overinvestment may also happen because the option of delaying investment is too costly. Thus, this research predicts that:

H3. Uncertainty increases firms' overinvestment.

3. RESEARCH METHOD

3.1. Data

The sample of this study consists of nonfinancial public firms from sixteen Asia-Pacific countries observed throughout 2008-2021. Firms with incomplete data, negative sales, and negative total assets are excluded from the sample. All financial statement data were sourced from the S&P Capital IQ database. The macroeconomic variables were obtained from the World Bank database. Additionally, the World Economic Uncertainty Index (WUI), developed by Ahir et al. (2022), was utilized to measure uncertainty, and it can be accessed from policyuncertainty.com. It aims to quantify the level of unknown risk and unpredictability that businesses and individuals face in a particular country. Table 1 presents the count of companies, observations, and IMF income levels by country. However, due to insufficient information and the necessity to present data spanning a minimum of three consecutive years, the sample for this study encompasses 15,746 companies representing diverse industries.

3.2. Model Specifications

This paper aims to see the effect of uncertainty on investment inefficiency. As such, the dependent variable utilized is investment inefficiency, derived from the residual approach proposed by Guariglia & Yang (2016). This approach operates under the assumption that a firm's optimal investment relies on past growth opportunities, quantified by the previous year's sales growth. Any deviation from the model is regarded as the error term of Equation (1), representing investment inefficiency.

$$Investment\ 1_{i,t} = \beta_0 + \beta_1 sales\ growth_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

Table 1. Number of companies and observations by country

Countries	Firms	Observations	IMF Income Level
Australia	1289	10,987	High
Bangladesh	143	210	Low
China	4244	37,432	Medium
Hong Kong	1182	11,124	High
India	299	1,330	Medium
Indonesia	523	4,859	Medium
Japan	3215	34,614	High
Malaysia	880	9,169	Medium
New Zealand	103	987	High
Pakistan	338	3,270	Medium
Singapore	516	4,931	High
South Korea	1763	10,029	High
Sri Lanka	201	2,307	Medium
Taiwan	1782	19,824	High
Thailand	678	6,686	Medium
Vietnam	439	3,439	Low

Investment $1_{i,t}$ represents the total investment done by a company i in the year t. where investment $1_{i,t}$ is identified as the net increase in its assets (tangible and intangible) divided by its lagged total assets. Whereas sales growth $_{i,t-1}$ is the rate of sales change of firm i in year t-2 to year t-1.

Alternatively, this study also utilizes an alternate model proposed by Samet & Jarboui (2017) as follows:

$$Investment\ 2_{i,t} = \beta_0 + \beta_1 Neg_{i,t-1} + \beta_2 sales\ growth_{i,t-1} + \beta_3 Neg_{i,t-1} \times sales\ growth_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

In this model, they add a $Neg_{i,t-1}$, which is a dummy variable made to represent negative sales growth. When the sales growth of a firm is negative, 1 is shown in the model and 0 otherwise.

Both Equation (1) and (2) represent suboptimal investment by examining their residuals. Firm observations experiencing an underinvestment scenario exhibit a negative residual, while those with an overinvestment scenario have a positive residual.

$$INEF_{j,i,t} = \beta_0 + \beta_1 WUI_{j,i,t-1} + \beta_2 ROA_{j,i,t} + \beta_3 SIZE_{j,i,t} + \beta_4 LEV_{j,i,t} + \beta_5 MB_{j,i,t} + \beta_6 CASH_{j,i,t} + \beta_7 GDP_{j,i,t} + \beta_8 DomCred_{j,i,t} + INDUSTRY + YEAR + n_{j,i,t} \quad (3)$$

Furthermore, the effects of uncertainty on investment inefficiencies were tested through the considerations of two scenarios: underinvestment and overinvestment. In the underinvestment scenario, the negative residual from the first model is utilized as a parameter to analyze the company's investment inefficiency. Higher negative values indicate a greater degree of underinvestment, reflecting higher inefficiency. Conversely, lower negative values suggest reduced underinvestment, indicating lower inefficiency. This same treatment was applied to the overinvestment scenario. In the overinvestment scenario, the positive residual from the first model was employed as a parameter to assess the company's investment inefficiency. Higher positive values point to a more pronounced overinvestment, signifying higher inefficiency. Conversely, lower positive values imply less overinvestment, showcasing a lower investment inefficiency of the firm. To test these statements, the following equations are employed:

$$UNDER_{j,i,t} = \beta_0 + \beta_1 WUI_{j,i,t-1} + \beta_2 ROA_{j,i,t} + \beta_3 SIZE_{j,i,t} + \beta_4 LEV_{j,i,t} + \beta_5 MB_{j,i,t} + \beta_6 CASH_{j,i,t} + \beta_7 GDP_{j,i,t} + \beta_8 DomCred_{j,i,t} + INDUSTRY + YEAR + n_{j,i,t} \quad (4)$$

$$OVER_{j,i,t} = \beta_0 + \beta_1 WUI_{j,i,t-1} + \beta_2 ROA_{j,i,t} + \beta_3 SIZE_{j,i,t} + \beta_4 LEV_{j,i,t} + \beta_5 MB_{j,i,t} + \beta_6 CASH_{j,i,t} + \beta_7 GDP_{j,i,t} + \beta_8 DomCred_{j,i,t} + INDUSTRY + YEAR + n_{j,i,t} \quad (5)$$

In Equation (3), (4), and (5), uncertainty serves as an independent variable, which is WUI (Ahir et al., 2022). A set of firm-level control variables is also included in the model. These firm's levels variables are the return on assets of the firm (ROA), the natural logarithm of the total assets (SIZE), the ratio of liabilities divided by total assets (LEV), the market-to-book ratio of the firm (MB), cash and cash equivalents then dividing it with the net assets (CASH). In addition, country-level control variables are also included, which are GDP growth (GDP) and the ratio of domestic credit to GDP (DomCred). This study adopts fixed-effects regression models with the Driscoll-Kraay robust standard error method to examine and test all proposed hypotheses. This methodological approach enables us to ensure the reliability and accuracy of our estimations, particularly when addressing potential heteroscedasticity and autocorrelation concerns in the data.

4. DATA ANALYSIS AND DISCUSSION

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics of all variables incorporated into the model. To mitigate the influence of outliers, all variables underwent winsorization at the 1st and 99th percentiles. Notably, the investment inefficiency levels of companies within the Asia-Pacific region are notably higher compared to their counterparts in the European region, as observed by Akron et al. (2022). This discrepancy could potentially stem from the differing economic landscapes and financial frameworks. The World Uncertainty Index (WUI), developed by Ahir et al., serves as a key indicator of global uncertainty levels. The mean WUI for the Asia-Pacific dataset is recorded at 0.1604, with a median of 0.1409, indicating a notable degree of uncertainty prevailing in the region. In terms of investment inefficiency, as measured by INEF1 and INEF2, the Asia-Pacific region exhibits higher levels compared to Europe. INEF1, with a mean of 0.0341 and a median of 0.0295, and INEF2, with a mean of 0.0695 and a median of 0.0350, both suggest a higher average and median investment

Table 2. Descriptive statistics

Variable	N	Mean	Median	Min	Max
INEF1	147,113	0.0323	0.0311	0	0.2617
INEF2	147,113	0.0676	0.0415	0	0.7673
WUI	147,113	0.159	0.1409	0	0.3992
ROA	147,113	0.018	0.0225	-.3783	0.1947
SIZE	147,113	19.373	19.2782	14.253	24.0555
LEV	147,113	0.459	0.445	0.0195	1.1293
MB	147,066	2.2131	1.2500	0.0023	18.9189
CASH	147,026	0.271	0.1754	0.045	3.457
GDP	147,113	3.997	4.0751	-6.1955	10.6359
DomCred	145,451	145.356	156.2299	15.589	258.9111

Note: INEF1 and INEF2 serve as proxies for the inefficiency in corporate investment decisions. WUI is an uncertainty proxy that quantifies country-level uncertainty levels developed by Ahir et al. (2020). Return on Assets (ROA) reflects the firm's profitability. Firm Size (SIZE) is represented by the logarithm of the firm's total assets. Leverage (LEV) measures the proportion of debt to the firm's total assets. The Market-to-Book Ratio (MB) captures the firm's growth. Cash Holdings (CASH) reflects the firm's liquidity. Gross Domestic Product Growth (GDP) represents the annual growth rate of the Gross Domestic Product. Domestic Credit (DomCred) refers to the extent of credit extended by financial institutions within a country's domestic financial system.

Table 3. Summary statistics: overinvest vs underinvest

Variable	Overinvest	Underinvest	t-stat
ROA	0.0305	0.0204	25.8987***
SIZE	19.4415	19.155	19.7758***
LEV	0.4533	0.4791	-4.2731***
MB	1.5615	1.1256	29.4522***
CASH	0.1219	0.1437	-33.6122***
Number Obs.	48,492	98,621	

Note: Return on Assets (ROA) reflects the firm's profitability. Firm Size (SIZE) is represented by the logarithm of the firm's total assets. Leverage (LEV) measures the proportion of debt to the firm's total assets. The Market-to-Book Ratio (MB) captures the firm's growth. Cash Holdings (CASH) reflects the firm's liquidity.

inefficiency in the Asia-Pacific context. Europe's greater concentration of developed economies with established financial systems may foster an environment where companies are better equipped to make efficient decisions, contributing to lower investment inefficiency levels.

Table 3 provides variable descriptive statistics comparing underinvesting and overinvesting firms. The data indicates that overinvesting firms exhibit a propensity for heightened growth opportunities compared to underinvesting firms. This phenomenon hints at the possibility that overinvesting firms may be driven by alluring growth prospects that compel them to seize available opportunities for expanding their asset base. Moreover, a distinct financing pattern surfaces as well. Overinvesting firms appear to lean more heavily on debt financing when contrasted with underinvesting firms. Various factors, including risk appetite, access to external funds, and perceptions of investment opportunities, could influence these differences in financing strategies. Furthermore, a clear distinction emerges in terms of cash holdings. Underinvesting firms exhibit higher cash reserves. This observation aligned with previous studies (Viviani et al., 2018), as managers of underinvesting firms might prioritize liquidity, choosing to accumulate cash buffers rather than deploy funds into growth opportunities that might carry uncertainty. These descriptive insights contribute to our understanding of the dynamics between investment inefficiency, growth prospects, financial decisions, and geographical influences. As this study proceeds, these observations serve as the foundation for the subsequent analytical exploration of the intricate interplay between uncertainty, investment inefficiency, and its diverse drivers within the Asia-Pacific business landscape.

4.2. Regression Results

Table 4 provides a comprehensive overview of the regression result derived from our empirical models Equation (3), (4), and (5). The estimations indicate a significant increase in corporate overinvestment levels in Asia-Pacific countries due to uncertainty, as depicted in column 3. These results shed light on the dynamics that

unfold during periods of heightened uncertainty, suggesting that companies operating within the Asia-Pacific region might incline towards investment practices that surpass their immediate investment opportunities. These findings align with existing research. García-Gómez et al. (2023) suggested that managers, in the face of heightened uncertainty, capitalize on the heightened information asymmetry to pursue investment avenues that may not be optimally aligned with the firm's long-term interests.

Conversely, the findings in columns 1 and 2 suggest that uncertainty does not contribute to overall investment inefficiencies and underinvestment. This result is in contrast to the study by Akron et al. (2022), which showed that firms in Europe tend to suffer underinvestment problems due to higher uncertainty. This distinction in outcomes may be attributed to the distinctive economic development trajectories of Europe and Asia. Firms in the Asia-Pacific region may be positioned within high-growth contexts, where the costs of delaying investment decisions could be too expensive. In line with previous research (Quader, 2023), in Asia, uncertainty might lead managers to increase investments as they see profit opportunities in more uncertain environments. This indicates that firms in the Asia-Pacific region could be using uncertainty as a strategy to their advantage, especially when they have plenty of growth opportunities. It is like they are making a deliberate choice to navigate uncertainty in a way that benefits their goals.

Furthermore, to ensure the robustness of our findings, additional tests were conducted by applying Equations (3), (4), and (5) to the alternative investment inefficiency calculated from Equation (2). The results of these additional tests are presented in Table 5. The overall consistency of the results with those presented in Table 4 underscores the main result robustness. Notably, the findings suggest that uncertainty tends to guide firms towards making overinvestment decisions. This aligns with the outcomes of Schwarz & Dalmácio's (2021) study, which focused on developing markets and found that uncertainty is associated with increased leverage among firms. This increase in debt might be utilized to finance their investment endeavors. These results highlight the potential impact of uncertainty on various aspects of firms' financial decisions, particularly in terms of leveraging resources for investment.

Additionally, this study extends the analysis by observing the impact of uncertainty on investment inefficiencies within specific sub-samples of observations. To accomplish this objective, this study categorized the samples based on their IMF income level countries, classifying them as high-income, middle-income, and low-income, as described in Table 1.

Table 4. Regression Results

	(1) INEF1	(2) UNDER1	(3) OVER1
L.WUI	0.0037	0.001	0.0108*
	(0.0024)	(0.0017)	(0.0057)
ROA	-0.00001	-0.0000	-0.0002*
	(0.0000)	(0.0000)	(0.0001)
SIZE	0.00003	-0.0003	-0.0023**
	(0.0007)	(0.0002)	(0.001)
LEV	-0.00001	0.0000	0.00003
	(0.0000)	(0.0000)	(0.0000)
MB	0.0005***	0.0000	0.0011***
	(0.0001)	(0.0000)	(0.0001)
CASH	-0.0055***	0.0005***	-0.0157***
	(0.0005)	(0.0001)	(0.0019)
GDP	0.0002	-0.0002*	0.001***
	(0.0002)	(0.0001)	(0.0003)
DC	-0.0001**	0***	-0.0004***
	(0.0000)	(0.0000)	(0.0001)
_cons	0.0559***	0.0269***	0.1441***
	(0.0107)	(0.0036)	(0.0133)
Observations	127,226	85,587	41,639
P-value	0.000	0.000	0.000
Pseudo R^2	0.0095	0.0209	0.0302

Note: This table shows the coefficients and the standard errors (in parentheses) of the hypothesis estimations using the fixed-effects regression with Driscoll Kraay's robust standard error. ***, **, and * indicate a confidence level of above 99%, 95% and 90%, respectively.

Table 5. Regression results with alternative investment inefficiency measurement

	(1) INEF2	(2) UNDER2	(3) OVER2
L.WUI	0.0037	0.0017	0.0109*
	(0.0028)	(0.0025)	(0.0055)
ROA	-0.0000	0.00001	-0.0002**
	(0.0000)	(0.0000)	(0.0001)
SIZE	0.0002	-0.0001	-0.0025**
	(0.0006)	(0.0002)	(0.001)
LEV	-0.00001	0.0000	0.00003
	(0.0000)	(0.0000)	(0.0000)
MB	0.0006***	-0.00002	0.0015***
	(0.0001)	(0.0000)	(0.0001)
CASH	-0.0055***	0.0007***	-0.016***
	(0.0005)	(0.0001)	(0.0015)
GDP	0.0001	-0.0003*	0.0015***
	(0.0002)	(0.0001)	(0.0002)
DC	-0.0002**	0***	-0.0005***
	(0.0001)	(0.0000)	(0.0001)
_cons	0.053***	0.0235***	0.146***
	(0.0109)	(0.0042)	(0.0135)
Observations	127,226	85,587	41,639
P-value	0.000	0.000	0.000
Pseudo R^2	0.0096	0.0189	0.0294

Note: This table shows the coefficients and the standard errors (in parentheses) of the hypothesis estimations using the fixed-effects regression with Driscoll Kraay's robust standard error. ***, **, and * indicate a confidence level of above 99%, 95% and 90%, respectively.

Table 6. Regression results in sub-sample based on countries' income level

	High-Income			Middle Income			Low Income		
	(1) INEF	(2) UNDER	(3) OVER	(4) INEF	(5) UNDER	(6) OVER	(7) INEF	(8) UNDER	(9) OVER
L.WUI	0.008	0.002	0.007	0.013***	-0.0019	0.023**	0.041**	-0.0007	0.07**
	(0.004)	(0.003)	(0.006)	(0.0039)	(0.0014)	(0.0075)	(0.011)	(0.0034)	(0.025)
ROA	-0.00***	0.00002**	-0.01***	0.000***	-0.000***	0.001**	0.01***	-0.000**	0.01***
	(0.000)	(0.0000)	(0.000)	(0.0001)	(0.0000)	(0.0002)	(0.000)	(0.0001)	(0.000)
SIZE	0.0013	-0.0003	-0.002	-0.0005	-0.001***	-0.0012	-0.0021	-0.0003	0.0035
	(0.0001)	(0.0003)	(0.002)	(0.0006)	(0.0001)	(0.0011)	(0.003)	(0.0004)	(0.007)
LEV	-0.000	-0.0000	0.0000	-0.0000	0.000***	0.000**	0.001**	0.0000**	0.00***
	(0.000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.000)	(0.0000)	(0.000)
MB	0.001***	-0.00002	0.001***	0.000***	-0.000**	0.001**	0.002**	0.00004	0.0034
	(0.000)	(0.0000)	(0.0003)	(0.0001)	(0.0000)	(0.0002)	(0.001)	(0.0001)	(0.003)
CASH	-0.006***	0.0004***	-0.02***	-0.01***	0.001***	-0.025***	-0.01***	0.001	-0.07***
	(0.001)	(0.0001)	(0.0022)	(0.0008)	(0.0002)	(0.0018)	(0.003)	(0.0007)	(0.01)
GDP	-0.000	-0.0003	0.001**	0.0001	-0.001***	0.001***	0.002***	-0.0001*	0.002**
	(0.000)	(0.0002)	(0.0005)	(0.0001)	(0.0000)	(0.0002)	(0.0005)	(0.0001)	(0.001)
DC	-0.00***	0.00002**	-0.00***	-0.00***	0.001***	-0.001***	0.0002**	0.000***	-0.0000
	(0.000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.000)
_cons	0.026*	0.03***	0.146***	0.074***	0.024***	0.125***	0.0173	0.023***	-0.0864
	(0.013)	(0.0053)	(0.0374)	(0.0115)	(0.0025)	(0.0202)	(0.0446)	(0.0057)	(0.111)
Obs,	70,049	51,765	18,244	54,345	32,026	22,319	2,874	1,794	1,080
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pseudo R^2	0.008	0.0201	0.0285	0.0196	0.0267	0.0414	0.0277	0.0212	0.0651

Note: This table shows the coefficients and the standard errors (in parentheses) of the hypothesis estimations using the fixed-effects regression with Driscoll Kraay's robust standard error. ***, **, and * indicate a confidence level of above 99%, 95% and 90%, respectively.

Next, Equation (3), (4), and (5) were used to assess whether the influence of uncertainty on investment inefficiencies differs across these income level categories. The results are presented in Table 6. Notably, column (1) until column (3) shows that uncertainty appears to exert no significant effect on investment inefficiencies within high-income countries. This may be attributed to the well-established financial systems and ample resources in these countries, allowing firms to navigate uncertainty without substantially altering their investment strategies. Conversely, the positive influence of uncertainty becomes significant in both middle-income and low-income countries, as shown in column (4) and column (9). Interestingly, the effect of uncertainty on overinvestment is particularly pronounced in low-income countries.

The differential impact of uncertainty across income levels unveils a dynamic interplay between economic context and firms' response to uncertainty. In high-income countries, where established financial systems and resources are more abundant, firms might be better equipped to manage uncertainty without significantly altering their investment strategies (Afonso & Blanco-Arana, 2024; Jamil et al., 2023). However, in the middle- and low-income countries, where financial constraints might be more pronounced, firms could be more prone to altering their investment decisions in response to heightened uncertainty (Fauceglia, 2015). A study conducted in Vietnam (Nguyen et al., 2022) supports these results, showing that Vietnamese firms tend to overinvest in utilizing their internal cash flow, particularly during periods of tightening monetary policy. Furthermore, the more pronounced effect of uncertainty on overinvestment in low-income countries highlights the potential challenges these firms face in managing their growth aspirations amidst uncertain conditions. The results reinforce the notion that firms in economically diverse contexts respond to uncertainty in varying ways, reflecting the intricate interplay between economic conditions, firm behavior, and investment outcomes. To sum up, our supplementary analysis provides a deeper understanding of how uncertainty's impact on investment inefficiencies varies within different income levels. By considering these nuances, this paper contributes to a richer understanding of how firms across various economic strata navigate uncertainty, further underscoring the importance of contextual factors in shaping investment decisions.

5. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This study delves into the intricate relationship between uncertainty and investment inefficiencies within Asia-Pacific countries. Our findings reveal that uncertainty tends to drive overinvestment rather than underinvestment among firms. This observation could be attributed to the prevalent characteristics of the Asia-Pacific region, where a substantial portion of firms comprises small entities with high growth potential. The associated cost of delaying investments in this context might be disproportionately high, prompting firms to seize available opportunities despite prevailing uncertainty. This phenomenon is particularly pronounced in middle- and low-income countries, emphasizing the potent role of uncertainty in shaping investment decisions.

The observed inclination toward overinvestment prompts critical questions about firms' risk mitigation strategies, suggesting a forward-looking approach to safeguard against potential downsides. Policymakers should recognize and address this complex relationship, considering mechanisms to enhance communication during uncertain times and encouraging strategic, sustainable investments. Additionally, policymakers could encourage firms to channel investments into areas that align with their core competencies and future growth prospects, thereby strategically steering overinvestment toward sustainable avenues. Furthermore, recognizing the Asia-Pacific region's evolving markets, policymakers could offer targeted support to firms in navigating uncertainty. This might involve providing access to resources, fostering innovation hubs, and creating platforms for knowledge sharing among industry players. In parallel, flexibility within regulatory frameworks could be introduced to accommodate firms' dynamic responses to uncertainty. Such provisions would enable firms to swiftly reallocate resources and adjust strategies, maximizing opportunities while minimizing risks. Acknowledging certain limitations in our study, the study acknowledges the need for further exploration into the specific mechanisms driving overinvestment in uncertain contexts. Additionally, future research could study industry-specific nuances more deeply and explore the effectiveness of different policy interventions in managing uncertainty.

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