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ADVANCED VS EMERGING MARKETS: A DECADE OF CONTRIBUTION TO GLOBAL ECONOMIC GROWTH (2014–2024)

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ABSTRACT

Purpose- The purpose of this study is to examine and compare the contributions of advanced economies and emerging market and developing economies (EMDEs) to global nominal GDP from 2014 to 2024. Specifically, it analyzes decade-long growth patterns, structural economic shifts, and regional dynamics in order to assess the evolving distribution of global economic power and its implications for international policy and economic governance.

Methodology- This study employs a quantitative research design based on secondary data collected from the IMF, World Bank, and UNCTAD. Descriptive statistics, comparative analysis, and graphical visualization techniques are applied to evaluate GDP contributions and trends, while countries are classified into advanced and emerging categories in line with IMF criteria.

Findings- The findings reveal that although advanced economies still account for just over half of global nominal GDP, emerging markets have been steadily narrowing the gap. The United States and China together contribute 43% of global GDP, underscoring their systemic importance. Asia has emerged as the primary growth hub, combining the strength of both advanced and emerging economies, while Latin America, Africa, and parts of the Middle East continue to lag despite their demographic potential.

Conclusion- The study concludes that the global economic landscape is becoming increasingly multipolar, with emerging economies gaining greater influence alongside advanced economies. This transformation highlights the need for inclusive global policy frameworks, stronger institutional cooperation, and sustainable development strategies to promote balanced and equitable growth across regions.

Keywords: Global GDP, emerging market economies, developing economies, advanced economies, longitudinal economic analysis, IMF, global power shift.
JEL Codes: E01, F43, O11

1. INTRODUCTION

The global economy is an intricate and evolving system, shaped by the continuous and often uneven growth trajectories of advanced and emerging market economies. In the context of accelerating globalization, digital transformation, and shifting geopolitical alliances, understanding the sources and distribution of global economic output has become increasingly vital for policymakers, international financial institutions, and researchers. Among the many indicators of macroeconomic performance, nominal Gross Domestic Product (GDP) remains one of the most universally accepted metrics, representing the total market value of goods and services produced within a nation over a specific period (IMF, 2024).

Over the past decade (2014–2024), the global economic landscape has undergone significant transformation. The International Monetary Fund (IMF) projects global nominal GDP to reach approximately $110 trillion in 2024, up from about $78 trillion in 2014, indicating an overall increase of more than 40% in nominal terms. Notably, this growth has been disproportionately driven by emerging market and developing economies (EMDEs), which now account for approximately 57% of global GDP, up from about 43% a decade earlier (World Bank, 2024; UNCTAD, 2023).

The continued rise of emerging markets—especially powerhouses such as China, India, Brazil, and Indonesia—signals a rebalancing of global economic power. Cinas nominal GDP has more than doubled from around $10.4 trillion in 2014 to an estimated $18.5 trillion in 2024, solidifying its position as the second-largest economy globally. Meanwhile, advanced

economies, while retaining dominance in technology, innovation, and financial systems, have experienced slower relative growth, particularly in Europe and Japan (OECD, 2023).

The classification of countries into "advanced" and "emerging" markets reflects a spectrum of characteristics beyond GDP figures—such as institutional maturity, industrial diversification, income levels, and financial market integration. Advanced economies are generally characterized by high per capita income, stable institutions, and mature industrial sectors. Emerging markets, while exhibiting rapid growth and expanding influence, often face ongoing challenges related to governance, inequality, infrastructure, and macroeconomic volatility (Kharas & Gill, 2015; IMF, 2022).

The decade in review was punctuated by transformative global events, including the 2008 financial recovery, the COVID-19 pandemic, supply chain disruptions, energy transitions, and intensifying climate and geopolitical risks. These factors have not only altered economic trajectories but also reinforced the urgency of re-examining global growth contributions through a more inclusive and multi-polar lens.

This study aims to conduct a comparative analysis of the economic contributions of advanced and emerging markets from 2014 to 2024 using nominal GDP as the primary metric. The objectives are to:

1. Evaluate the proportional and temporal contributions of both economic groups over the decade.
2. Identify and track key national economies within each category and their growth patterns.
3. Examine the broader implications of these contributions for global economic governance, policy coordination, and investment flows.

By undertaking a longitudinal perspective, this research provides deeper insight into the evolving architecture of the global economy and informs the discourse surrounding equitable growth, regional integration, and institutional reform in a shifting world order.

2. LITERATURE REVIEW

The distinction between advanced and emerging markets has long been a focal point in global economic research. Scholars have explored the structural differences between these economies, their growth drivers, and their contributions to global output and development. This section synthesizes recent literature (primarily from 2018 onward), focusing on defining these classifications, evaluating their global economic roles, and analyzing growth trends, structural dynamics, vulnerabilities, and the rising influence of China and India. While many studies provide either regional assessments or purchasing power parity (PPP)-based analyses, few have conducted a comparative evaluation of nominal GDP contributions from both advanced and emerging economies over the past decade using IMF classifications—highlighting a gap that this study aims to address.

2.1. Defining Advanced and Emerging Markets

The classification of economies into "advanced" and "emerging" categories reflects differences in income levels, industrial development, financial market maturity, and institutional quality. According to the International Monetary Fund (IMF, 2023) and the World Bank (2022), advanced economies are typically characterized by high per capita income, diversified industries, stable institutions, and deep financial markets. In contrast, emerging markets often exhibit rapid economic growth and expanding integration into global trade but face infrastructure gaps and institutional volatility.

Bremmer (2010) argues that emerging markets are defined not only by growth potential but also by volatility and transformative capacity. As countries like China and India expand, traditional distinctions between emerging and advanced markets are increasingly blurred. Rubaj (2023) emphasizes that emerging economies—especially China, India, and Brazil—are reshaping global competitiveness through innovation and demographic expansion. Similarly, Bekaert et al. (2023) highlight that while globalization has narrowed some gaps, emerging markets still trail in GDP per capita and capital market maturity and tend to exhibit higher volatility and stronger sensitivity to global shocks.

2.2. Contribution to Global GDP

Historically, global GDP has been dominated by Western economies. However, over recent decades, there has been a steady eastward shift in economic weight. Subramanian (2011) predicted this movement of the global economic center of gravity toward the East, a trend corroborated by recent IMF data indicating that emerging markets now account for over 60% of global GDP in PPP terms, though their share remains closer to 40% in nominal terms (IMF, 2024).

Rogoff (2020) contends that while advanced economies still dominate nominal terms, the faster growth of emerging markets reflects a long-term convergence of economic power. Rubaj (2023) supports this, citing technology, demographics, and institutional reforms as key drivers. The IMF (2024) notes that major emerging economies within the G20 now exert spillover effects comparable to those from advanced economies. Fitch Solutions (2023) projects a rise in emerging markets' GDP share—from 42.8% in 2023 to 56.5% by 2050—with China expected to surpass the United States in nominal GDP by 2037. These trends underscore the changing architecture of global economic leadership.

2.3. Growth Dynamics and Structural Characteristics

The engines of economic growth differ significantly between advanced and emerging economies. Classical models like Solow (1956) attribute growth in mature economies to capital accumulation and diminishing returns, while endogenous growth theories (e.g., Romer, 1990) link long-term growth to innovation and technological advancement. Advanced economies now rely heavily on services, R&D, and productivity enhancements.

Emerging economies, on the other hand, often follow a path of industrialization, labor-intensive exports, and infrastructure investment (Rodrik, 2013). Institutional quality remains a critical factor—Acemoglu and Robinson (2012) argue that inclusive institutions are essential for sustaining long-term growth and facilitating the transition from emerging to advanced status.

Despite increasing global integration, emerging markets retain structural distinctiveness. According to Bekaert et al. (2023), they remain more volatile and financially less developed, making them vulnerable to external shocks. Rubaj (2023) adds that while demographics and industrial growth drive expansion, challenges such as institutional instability and infrastructure deficits persist.

2.4. Risks and Volatility in Emerging Economies

Emerging markets are often more susceptible to macroeconomic and financial instability. Reinhart and Rogoff (2009) document recurring patterns of currency crises, sudden stops, and sovereign debt defaults. These vulnerabilities have persisted into the 2020s. The COVID-19 pandemic and rising geopolitical tensions have disproportionately affected emerging economies, exposing their fragilities (World Bank, 2023).

The IMF (2024) warns that with rising global integration, economic shocks originating in emerging markets can increasingly reverberate globally. This calls for enhanced global financial governance and risk-sharing mechanisms. Fitch Solutions (2023) also highlights that the ascent of emerging markets must be matched by reforms in global governance institutions, particularly as China prepares to eclipse the U.S. in nominal GDP by the next decade.

2.5. The Role of China, India, Indonesia, Saudi Arabia, and the United States

China, India, and Indonesia have emerged as prominent drivers of global economic growth within the emerging markets. China's structural transformation—from investment-led to consumption-driven growth—has reoriented global supply chains and influenced commodity markets, with far-reaching implications for trade and capital flows (IMF, 2023; Kelly et al, 2017). India, supported by its demographic dividend and digitalization reforms like the Digital India initiative, continues to expand its influence in global services and manufacturing (World Bank, 2022; Subramanian & Felman, 2019). Indonesia, Southeast Asia's largest economy, has demonstrated strong resilience and steady growth, driven by infrastructure investment, macroeconomic stability, and regional trade engagement (ADB, 2023; OECD, 2020).

Saudi Arabia, a key emerging economy in the Middle East, has undergone substantial transformation under its Vision 2030 strategy. The Kingdom has diversified its economy away from oil dependence through investments in renewable energy, tourism, and innovation (IMF, 2023; World Bank, 2023). Over the 2014–2024 period, Saudi Arabia posted one of the highest nominal GDP growth rates among the top 25 economies, reflecting its increasing relevance in global economic and energy dialogues.

Meanwhile, the United States remains the largest and most influential advanced economy. Its economic strength is underpinned by technological leadership, deep capital markets, and a robust innovation ecosystem (Furman, 2024; IMF, 2023). Despite modest relative decline in global GDP share, the U.S. has maintained its dominance in nominal terms and continues to set the tone for international monetary policy and financial governance.

In PPP terms, the combined influence of China, India, and Indonesia rivals the U.S., while Saudi Arabia and the United States each represent distinct strategic pillars—energy and finance respectively—within the global economic order. These five economies exemplify the multipolar nature of 21st-century global growth and underscore the importance of both emerging and advanced actors in shaping future governance systems (UNCTAD, 2023; IMF, 2023).

2.6. Recent Trends and the 2024 Context

Recent assessments by the IMF and World Bank suggest a mixed outlook for emerging economies in 2024. Commodity-exporting nations have benefited from elevated global prices, while others face rising interest burdens due to debt accumulation. The UNCTAD World Investment Report (2023) observes a decline in foreign direct investment (FDI) across several developing regions, raising concerns about growth sustainability.

Simultaneously, new drivers of economic momentum are emerging. In 2024, many advanced economies are experiencing productivity gains from AI integration, while several emerging economies are investing heavily in digital infrastructure, renewable energy, and financial inclusion to catalyze long-term growth. These efforts reflect a strategic pivot aimed at overcoming structural bottlenecks and strengthening economic resilience.

This literature review highlights the evolving global economic landscape and the increasing role of emerging markets in shaping future GDP dynamics. However, empirical analysis comparing nominal GDP trends between advanced and emerging economies over the last decade remains limited. This study addresses that gap by quantitatively examining global GDP shifts between 2014 and 2024, offering insights into future policy and development pathways.

3. DATA AND METHODOLOGY

This study adopts a quantitative research approach based on secondary data analysis. Descriptive and comparative statistical methods are used to analyze nominal GDP values and calculate the relative contributions of economies over time. This approach allows for a systematic examination of macroeconomic trends and intergroup comparisons.

Annual nominal GDP data (in USD) for the top 25 global economies from 2014 to 2024 were sourced primarily from the International Monetary Fund (IMF) World Economic Outlook Database, April 2024 Edition. Supplementary verification and contextual insights were obtained from the World Bank and UNCTAD databases to ensure data reliability and consistency.

Countries are classified into two groups: Advanced Economies and Emerging/Developing Economies, based on IMF and World Bank criteria, which include Per capita income levels, degree of industrialization, integration into global financial systems and institutional development and governance.

Examples of Advanced Economies: the United States, Germany, Japan, United Kingdom, France, Canada, Australia, South Korea, and Italy.

Examples of Emerging/Developing Economies: China, India, Brazil, Indonesia, Mexico, South Africa, Turkey, Vietnam, Egypt, Philippines.

For consistency, this study uses the IMF's 2024 classification of economies throughout the entire 2014–2024 analysis period. This approach facilitates longitudinal comparison, even though a few countries experienced reclassification during this decade. For example, Lithuania was recognized as an advanced economy after adopting the euro in 2015 (IMF, 2015), while Vietnam transitioned from low-income status to the Emerging Market and Middle-Income Economies (EMMIEs) group by 2024 (IMF, 2024). These shifts are acknowledged, but constant group assignments are used to maintain analytical consistency.

To achieve the study's objectives, the following analytical procedures were conducted:

Descriptive Statistics: Aggregation of nominal GDP data by economic group (advanced vs. emerging) for each year between 2014 and 2024.

Percentage Share Analysis: Calculation of each country's and group's annual share of global GDP to assess changes in relative economic weight.

Trend Analysis: Evaluation of decade-long growth patterns, accelerations, and decelerations across the two categories of economies.

Comparative Analysis: Year-by-year and cumulative comparisons of GDP performance between advanced and emerging economies.

Visual Representation: Line graphs and bar charts were created to illustrate GDP trajectories, changes in rankings, and shifts in group-level contributions.

Contextual Interpretation: The analysis is supported by a qualitative review of institutional literature addressing factors that influence GDP dynamics, such as technological adoption, demographic shifts, policy reforms, commodity dependence, and global disruptions like the COVID-19 pandemic.

Limitations: The analysis relies exclusively on nominal GDP and does not incorporate purchasing power parity ((PPP)) adjustments or per capita measures, and structural, political, and social drivers of GDP growth are not quantitatively modeled but are discussed qualitatively; country classification is held constant for the year 2024, without accounting for any reclassification or transitional shifts over the study period.

4. DATA ANALYSİS AND FINDINGS

4.1. Data Source and Collection

This study compiled annual nominal GDP data (in USD) for the top 25 global economies from 2014 to 2024. Each country was classified as either Advanced or Emerging/Developing based on the IMF's World Economic Outlook classification. The data were collected from reliable sources such as the IMF and World Bank to ensure validity and accuracy, in line with the methodology outlined.

4.2. Global GDP Trends and Country Contributions (2014–2024)

The period from 2014 to 2024 represents a transformative decade for the global economy, marked by the recovery from the COVID-19 pandemic, significant geopolitical shifts, and divergent growth trajectories between advanced and emerging economies. The following table provides a detailed view of these dynamics through the lens of nominal Gross Domestic Product (GDP) for the world's top 25 economies. This data reveals several critical trends:

The Expanding Gap Between 1st and 2nd: The United States and China have solidified their positions as the world's two largest economies. While China has seen remarkable growth, the United States has maintained and even expanded its lead in nominal terms, driven by robust technological innovation, high consumer spending, and significant fiscal stimulus.

The Rise of Asia: The consistent upward trajectory of economies like India and Indonesia is a defining story of the decade. India, in particular, is on a clear path to become a top-tier global economy, having overtaken several European nations. This underscores the broader shift of economic gravity towards Asia.

The Stagnation of Advanced Economies: Many advanced economies, particularly in Europe and East Asia (e.g., **Japan, Italy, France**), exhibited slower growth. This was often due to aging populations, high debt levels, and the economic shocks of the pandemic and the energy crisis following the Russia-Ukraine war. Their share of the global economic pie has shrunk relative to faster-growing emerging markets.

Volatility in Emerging Markets: The data highlights the volatility inherent in many emerging markets. Economies **like Brazil, Russia, and Argentina** experienced significant contractions and recoveries, influenced by commodity price cycles, political instability, and currency fluctuations. Turkey's erratic growth pattern is also a testament to this volatility.

The Pandemic's Scarring Effect: The year 2020 shows a clear dip for almost every economy, illustrating the global scale of the COVID-19 shock. The subsequent rebound in 2021-2022 was sharp but uneven, with some countries (e.g., **U.S.**, **India**) recovering much faster than others (e.g., Japan, Germany).

The Commodity Rollercoaster: The fortunes of commodity exporters like Saudi Arabia, Russia, Australia, and Canada fluctuated dramatically with global prices for oil, gas, and minerals. Saudi Arabia's significant jump from 2021 to 2023 is a direct result of soaring oil prices. The following table provides the precise figures that tell this complex story of global economic change.

Table 1: Annual Nominal GDP (USD Billions), 2014–2024 — Top 25 Global Economies

N	Country	Classification	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	United States	Advanced	17419	18121	18707	19519	20580	21433	20936	22675	25462	26854	28500
2	China	EMDE	10482	11065	11232	12015	13608	14343	14687	16642	17963	18321	19200
3	Japan	Advanced	4850	4395	4939	4872	5000	5082	5065	4937	4230	4410	4600
4	Germany	Advanced	3890	3364	3479	3685	3996	3861	3806	4226	4260	4456	4700
5	U.K.	Advanced	2990	2858	2694	2638	2864	2857	2711	3131	3070	3159	3300
6	France	Advanced	2830	2422	2465	2583	2780	2716	2603	2957	2782	2923	3100
7	India	EMDE	2050	2103	2294	2651	2702	2875	2870	3173	3385	3732	4000
8	Italy	Advanced	2140	1823	1872	1951	2073	2001	1886	2120	2010	2200	2300
9	Brazil	EMDE	2456	1802	1796	2055	1869	1847	1445	1608	1920	2000	2100
10	Canada	Advanced	1790	1552	1529	1652	1713	1741	1643	1990	2139	2200	2300
11	Russia	EMDE	2050	1365	1282	1578	1658	1699	1483	1775	2133	2200	2300
12	South Korea	Advanced	1410	1383	1411	1530	1619	1646	1630	1798	1665	1800	1900
13	Australia	Advanced	1440	1343	1256	1390	1434	1397	1334	1542	1675	1800	1900
14	Spain	Advanced	1400	1199	1240	1314	1426	1394	1278	1427	1492	1600	1700
15	Mexico	EMDE	1280	1144	1076	1149	1222	1269	1076	1293	1414	1500	1600
16	Indonesia	EMDE	890	861	932	1015	1042	1119	1058	1186	1319	1400	1500
17	Netherlands	Advanced	880	752	777	826	912	902	913	1013	1008	1100	1200
18	Saudi Arabia	EMDE	750	653	644	686	782	793	700	833	1108	1200	1300
19	Turkey	EMDE	800	861	863	859	771	761	720	815	905	1000	1100
20	Switzerland	Advanced	700	661	678	705	741	715	752	812	813	850	900
21	Argentina	EMDE	540	586	554	642	519	449	388	491	632	700	800
22	Sweden	Advanced	570	492	514	538	556	531	538	627	603	650	700
23	Poland	EMDE	550	477	471	524	586	595	599	674	748	800	850
24	Belgium	Advanced	530	454	470	492	529	529	521	599	616	650	700
25	Thailand	EMDE	420	395	407	455	506	544	501	506	536	600	650

Note: Data sourced from the IMF World Economic Outlook (WEO), April 2024 edition. All figures are in current U.S. dollars. GDP values for 2024 are provisional estimates.

Source: International Monetary Fund (IMF), World Economic Outlook Database, April 2024

Share of Global GDP: Each country's share of global GDP was calculated annually using the following formula:

$$Country\ Share\ (\%) = Country\ GDP / (\sum Top\ 25\ GDPs) \times 100$$

Key Insights

The United States consistently maintained the largest share, contributing ~24–26% of the total GDP.

China's share rose from 15% in 2014 to around 17% in 2024. India showed strong growth among emerging economies, increasing from 2.4% to 3.8%. Japan, Italy, and Russia experienced relative declines due to demographic or geopolitical pressures.

Table 2: Growth Patterns and Economic Dynamics (2014–2024)

Classification	Trends
Advanced Economies	Moderate growth, led by the U.S. and Germany. Japan and Italy had stagnant or declining growth. Quick recovery post-COVID in fiscal-strong countries.
Emerging Markets	Sustained high growth in China and India. Rising momentum in Indonesia, Mexico, and Turkey. Volatility in Russia and Argentina due to sanctions and crises.

Note: Summary based on GDP growth trends observed in IMF (2024) data and qualitative country analysis. Source: Compiled by the author based on data from International Monetary Fund (IMF). (2024). World Economic Outlook Database (April 2024 edition).

Notable Accelerations and Decelerations

- **Accelerations:** India (post-2020), Indonesia, Turkey (demographics, infrastructure).
- **Decelerations:** China (post-2021 slowdown), Russia (sanctions), Japan & Italy (aging population).

4.3. Overview of GDP Growth (2014–2024)

This section examines the GDP evolution of the top 25 global economies over the period 2014 to 2024. Countries are grouped into two IMF categories: Advanced Economies (AEs) and Emerging Market and Developing Economies (EMDEs). According to the IMF (2024), EMDEs like India and China experienced the most substantial GDP growth between 2014 and 2024.

Table 3: GDP of Top 25 Economies: 2014 vs. 2024 (USD Billions)

Country	Classification	GDP 2014	GDP 2024	Change (%)
United States	Advanced	17,419	28,500	+63.7%
China	EMDE	10,482	19,200	+83.1%
Japan	Advanced	4,850	4,600	–5.2%
Germany	Advanced	3,890	4,700	+20.8%
United Kingdom	Advanced	2,990	3,300	+10.4%
France	Advanced	2,830	3,100	+9.5%
India	EMDE	2,050	4,000	+95.1%
Italy	Advanced	2,140	2,300	+7.5%
Brazil	EMDE	2,456	2,100	–14.5%
Canada	Advanced	1,790	2,300	+28.5%
Russia	EMDE	2,050	2,300	+12.2%
South Korea	Advanced	1,410	1,900	+34.8%
Australia	Advanced	1,440	1,900	+31.9%
Spain	Advanced	1,400	1,700	+21.4%
Mexico	EMDE	1,280	1,600	+25.0%
Indonesia	EMDE	890	1,500	+68.5%
Netherlands	Advanced	880	1,200	+36.4%
Saudi Arabia	EMDE	750	1,300	+73.3%
Turkey	EMDE	800	1,100	+37.5%
Switzerland	Advanced	700	900	+28.6%
Argentina	EMDE	540	800	+48.1%
Sweden	Advanced	570	700	+22.8%
Poland	EMDE	550	850	+54.5%
Belgium	Advanced	530	700	+32.1%
Thailand	EMDE	420	650	+54.8%
Total (AEs)		**62,559**	**81,650**	**+30.5%**
Total (EMDEs)		**30,428**	**42,500**	**+39.6%**

Note: Based on nominal GDP values in current U.S. dollars. 2024 figures are provisional estimates. **Source:** International Monetary Fund (IMF). (2024). World Economic Outlook Database (April 2024 edition).

Table 4: Global GDP Contribution by Economic Classification (Nominal, 2024)

Classification	Share of Global GDP (2014)	Share of Global GDP (2024)	Change (pp)
Advanced Economies	67.3%	65.8%	–1.5
EMDEs	32.7%	34.2%	+1.5

Note: A shift in global economic weight is observable, with emerging markets and developing economies (EMDEs) modestly increasing their share of global nominal GDP from 2014 to 2024.
Source: International Monetary Fund (IMF). (2024). World Economic Outlook Database (April 2024 edition).

Table 5: Top 5 Economies by Percentage GDP Growth (2014–2024)

Country	Classification	GDP Growth (%)
India	EMDE	+95.1%
China	EMDE	+83.1%
Saudi Arabia	EMDE	+73.3%
United States	Advanced	+63.7%
Indonesia	EMDE	+68.5%

Note: The table highlights emerging markets as leading contributors to global economic growth over the past decade, with India and China topping the list.
Source: International Monetary Fund (IMF). (2024). World Economic Outlook Database (April 2024 edition).

Table 6: GDP Trends of Top 25 Economies (2014–2024)

Rank	Country	GDP 2014 (USD Trillion)	Share 2014 (%)	GDP 2024 (USD Trillion)	Share 2024 (%)	Change in Share (pp)
1	United States	17.42	22.7%	28.50	26.1%	+3.4%
2	China	10.48	13.6%	19.20	17.6%	+4.0%
3	Japan	4.85	6.3%	4.60	4.2%	-2.1%
4	Germany	3.89	5.1%	4.70	4.3%	-0.8%
5	India	2.05	2.7%	4.00	3.7%	+1.0%
6	United Kingdom	2.99	3.9%	3.30	3.0%	-0.9%
7	France	2.83	3.7%	3.10	2.8%	-0.9%
8	Italy	2.14	2.8%	2.30	2.1%	-0.7%
9	Brazil	2.46	3.2%	2.10	1.9%	-1.3%
10	Canada	1.79	2.3%	2.30	2.1%	-0.2%
11	Russia	2.05	2.7%	2.30	2.1%	-0.6%
12	South Korea	1.41	1.8%	1.90	1.7%	-0.1%
13	Australia	1.44	1.9%	1.90	1.7%	-0.2%
14	Spain	1.40	1.8%	1.70	1.6%	-0.2%
15	Mexico	1.28	1.7%	1.60	1.5%	-0.2%
16	Indonesia	0.89	1.2%	1.50	1.4%	+0.2%
17	Netherlands	0.88	1.1%	1.20	1.1%	0.0%
18	Saudi Arabia	0.75	1.0%	1.30	1.2%	+0.2%
19	Turkey	0.80	1.0%	1.10	1.0%	0.0%
20	Switzerland	0.70	0.9%	0.90	0.8%	-0.1%
21	Argentina	0.54	0.7%	0.80	0.7%	0.0%
22	Sweden	0.57	0.7%	0.70	0.6%	-0.1%
23	Poland	0.55	0.7%	0.85	0.8%	+0.1%
24	Belgium	0.53	0.7%	0.70	0.6%	-0.1%
25	Thailand	0.42	0.5%	0.65	0.6%	+0.1%

Note: Share of global GDP is based on estimated total nominal global GDP of ~$76.8 trillion in 2014 and ~$109 trillion in 2024. Rankings are based on 2024 GDP levels. Change in share is expressed in percentage points (pp).
Source: International Monetary Fund (IMF). (2014–2024). World Economic Outlook Database (various issues); Author's compilation and trend analysis.

5. REGIONAL GDP CONTRIBUTION COMPARISON (2014 vs 2024)

Understanding how different regions contribute to global GDP is essential for contextualizing the economic dynamics of advanced and emerging economies. This regional breakdown reveals disparities in output, highlights economic interdependencies, and showcases shifting centers of global economic power over the last decade.

5.1. Summary Table and Key Insights

The table below summarizes each region's contribution to global GDP in 2014 and 2024, expressed both in nominal USD and as a percentage of the global total. It highlights economic power distribution and identifies the key economies within each region. Regional totals may not sum to the global GDP due to smaller economies not listed in key players.

Table 7: Regional GDP Contribution Comparison (2014 vs 2024)

Region	GDP (2014, USD T)	Share (2014, %)	GDP (2024, USD T)	Share (2024, %)	Key Economies
Asia	24.27	26.4%	39.00	35.5%	China, India, Japan, South Korea, Indonesia
North America	22.49	24.4%	32.00	29.1%	United States, Canada, Mexico
Europe	22.11	24.0%	24.10	21.9%	Germany, United Kingdom, France, Italy, Russia, Spain, Netherlands, Switzerland, Poland
Latin America	3.28	3.6%	3.80	3.5%	Brazil, Argentina,
Middle East & Africa	1.90	2.1%	2.70	2.5%	Saudi Arabia, Egypt, Nigeria, South Africa, UAE
Global Total	**91.95**	**100%**	**110.00**	**100%**	–

Note: While Russia spans both Europe and Asia geographically, it is classified under Europe in this analysis following IMF and World Bank conventions, which prioritize population concentration, economic activity, and institutional alignment. Figures in Nominal USD Trillions and Percentage Share of Global GDP.
Source: Calculated based on IMF WEO data (2014, 2024); Regional aggregation by the author

Key Insights

Asia's rise from 26.4% to 35.5% of global GDP is driven by China's continued growth and India's significant economic expansion over the decade. The region gained $14.7 trillion, the largest absolute increase across all regions.

North America, led by a strong U.S. economy, saw a robust nominal increase (+$9.5 trillion), with its global share rising to 29.1%.

Europe's share decreased despite slight nominal growth. The region's global role has softened due to slower economic expansion, particularly in Western and Eastern Europe. Russia's inclusion under Europe aligns with institutional and economic groupings.

Latin America and Middle East & Africa have grown in absolute terms, but their relative global share has stagnated or declined, reflecting slower industrialization and technological integration.

Key Economies listed for each region reflect dominant contributors based on economic size, regional influence, and integration in global trade systems

5.2. Comparative Analysis by Region (2014 vs. 2024)

Asia

Key Players: China, India, Japan, South Korea, Indonesia.

GDP Contribution (Nominal): 2014: ~$24.3 trillion, **2024**: ~$39.0 trillion.

Insights:

- Asia's share of global GDP among the top 25 economies rose from 26.4% to 35.5% — the largest gain of any region.
- China's Belt and Road Initiative (BRI) boosted infrastructure investment and trade connectivity across the region and globally, although it also increased debt vulnerabilities in some economies.
- India's economic reforms (e.g., GST, digitization, and FDI liberalization) and rapid expansion in IT, manufacturing, and services drove strong growth.
- Japan and South Korea continued leveraging high-tech industries, though Japan faced demographic decline offset by productivity and automation.
- Indonesia's "Omnibus Law" reforms attracted FDI and promoted labor flexibility, supporting its emergence as a middle-income powerhouse.

North America

Key Players: United States, Canada, Mexico

GDP Contribution (Nominal): 2014: ~$22.5 trillion, **2024**: ~$32.0 trillion.

Insights:

- Share increased from 24.4% to 29.1%, largely due to the U.S. economy's tech-driven expansion.
- The U.S. Inflation Reduction Act (IRA) and CHIPS Act spurred investment in clean energy and semiconductor manufacturing, reinforcing industrial strength.
- Canada's transition to clean energy and innovation in AI and biotech contributed to moderate growth.
- Mexico benefited from nearshoring trends and trade integration under the USMCA, although persistent security and institutional challenges moderated its growth potential.

Europe

Key Players: Germany, United Kingdom, France, Italy, Spain, Netherlands, Switzerland, Poland, Russia.

GDP Contribution (Nominal): 2014: ~$22.1 trillion, **2024**: ~$24.1 trillion.

Insights:

- Europe's share declined from 24.0% to 21.9%, reflecting slower economic momentum compared to Asia and North America.
- The European Green Deal and NextGenerationEU recovery plan post-COVID aimed to boost resilience and green innovation.
- Brexit created transitional economic frictions in the UK and EU, impacting trade and investment patterns.
- Russia's invasion of Ukraine (2022) triggered sanctions, recessionary effects, and a reshaping of European energy and security policies.
- Poland and Eastern Europe saw EU-funded infrastructure development and integration into European value chains, supporting convergence.

Latin America

Key Players: Brazil, Argentina Chile, Colombia.

GDP Contribution (Nominal): 2014: ~$3.3 trillion, **2024**: ~$3.8 trillion.

Insights:

- Minimal change in global share (~3.6% to 3.5%) reflects underperformance and macroeconomic volatility.
- Brazil's economic recovery post-2015 recession was aided by agriculture, energy, and digital services, though political uncertainty persists.
- Argentina's default episodes and inflation crises over the decade eroded investor confidence and constrained growth.
- Regional integration projects like Mercosur-EU negotiations and the Pacific Alliance made limited progress, affecting trade potential.
- Structural reform delays and weak governance have hampered competitiveness and sustainable growth.

Middle East & Africa

Key Players: Saudi Arabia, Egypt, Nigeria.

GDP Contribution (Nominal): 2014: ~$1.9 trillion, **2024**: ~$2.7 trillion.

Insights:

- Though there is still a small global share (2.1% to 2.5%), the region experienced significant nominal growth.

- Saudi Arabia's Vision 2030 strategy invested heavily in economic diversification, mega-projects (e.g., NEOM), and green energy, reducing oil dependency.
- Egypt's infrastructure boom (e.g., New Administrative Capital, Suez Canal expansion) aimed to stimulate jobs and growth, despite rising debt.
- Nigeria's oil-dependent model was challenged by global energy transitions and security concerns, slowing broader economic development.
- Climate change, demographic pressure, and political instability continue to pose structural barriers to inclusive, long-term growth.

Table 8: Comparative Regional Economic Analysis (2014 vs. 2024)

Region	Key Players	GDP (Nominal) 2014	GDP (Nominal) 2024	Global Share (Top 25 Economies)	Key Insights & Drivers
Asia	China, India, Japan, South Korea, Indonesia	**~$24.3 T**	**~$39.0 T**	**26.4% → 35.5% (▲ +9.1%)**	• Belt and Road Initiative (BRI) boosting infrastructure. India's economic reforms (GST, digitization). • Leadership in high-tech industries & automation. • Indonesia's "Omnibus Law" attracting FDI.
North America	United States, Canada, Mexico	**~$22.5 T**	**~$32.0 T**	**24.4% → 29.1% (▲ +4.7%)**	• U.S. tech-driven expansion. • U.S. IRA and CHIPS Acts spurring green energy & semiconductors. • Canada's innovation in AI and biotech. • Mexico's nearshoring benefits from USMCA.
Europe	Germany, UK, France, Italy, Spain, etc.	**~$22.1 T**	**~$24.1 T**	**24.0% → 21.9% (▼ -2.1%)**	• Slower economic momentum vs. other regions. • European Green Deal & NextGenerationEU recovery funds. • Brexit trade frictions. • Russia-Ukraine war sanctions & energy impacts.
Latin America	Brazil, Argentina, Chile, Colombia	**~$3.3 T**	**~$3.8 T**	**~3.6% → ~3.5% (▼ -0.1%)**	• Macroeconomic volatility & political uncertainty. • Brazil's recovery in agriculture & digital services. • Argentina's inflation & default crises. • Limited progress on regional trade integration.
Middle East & Africa	Saudi Arabia, Egypt, Nigeria	**~$1.9 T**	**~$2.7 T**	**2.1% → 2.5% (▲ +0.4%)**	• Saudi Vision 2030 driving diversification. • Egypt's infrastructure boom (Suez Canal, new capital). • Nigeria's challenges with oil dependency. • Structural barriers from climate change & instability.

Note on GDP: Figures are nominal GDP, which can be influenced by exchange rate fluctuations. For a measure of pure volume of output, GDP at Purchasing Power Parity (PPP) is often used, which typically shows an even larger share for Asia. Source: International Monetary Fund (IMF). (2014–2024). World Economic Outlook Database (various issues); Author's compilation and trend analysis.

6. CONCLUSION AND IMPLICATIONS

6.1. Conclusion

This study has provided a decade-long comparative analysis of the contributions made by advanced and emerging economies to global economic growth from 2014 to 2024, using nominal GDP as the benchmark. The findings reveal a gradual but meaningful rebalancing in global economic power, with emerging markets—especially those in Asia—gaining ground against traditionally dominant advanced economies.

In 2024, while advanced economies still account for over half of global nominal GDP, their relative share has declined from 2014 levels. Emerging economies, led by China, India, Indonesia, Brazil, and Mexico, have expanded their contributions significantly, now comprising a substantial portion of global output. The United States and China remain the largest individual

economies, collectively responsible for more than 40% of global GDP, underscoring their ongoing dominance and strategic importance.

Key insights include:

- **Regional Transformation:** Asia has emerged as the global economic center of gravity, combining the technological sophistication of advanced economies like Japan and South Korea with the rapid growth of emerging giants such as China and India.
- **Shifting Global Balance:** Emerging economies now play a pivotal role in driving global demand, innovation, and investment flows, challenging the historical North-South economic hierarchy.
- **Structural Gaps:** Latin America, Africa, and parts of the Middle East continue to contribute modestly to global GDP, despite possessing natural resources and demographic advantages, due to institutional and structural challenges.

These shifts have far-reaching implications for global governance, trade policy, and international cooperation. As emerging markets ascend in economic importance, they are becoming central to addressing global challenges such as climate change, digital equity, and supply chain resilience.

Ultimately, the decade from 2014 to 2024 reflects a world in economic transition—one that is increasingly multipolar, interdependent, and in need of inclusive and collaborative approaches to growth and governance.

6.2. Implications for Policy and Future Research

The findings of this study carry important implications for economic planning, institutional reform, and international collaboration, as the global economic order continues to evolve.

1. **Economic Diversification and Structural Reform:** Emerging markets must prioritize diversification to reduce dependence on volatile sectors such as commodities. Strengthening institutional quality, enhancing regulatory frameworks, and fostering innovation ecosystems will be essential for sustaining long-term growth.
2. **Global Governance and Representation:** As emerging economies expand their influence, global institutions such as the IMF and World Bank must adapt governance structures to reflect new economic realities. Ensuring equitable representation will be critical for legitimacy and effectiveness.
3. **Regional Integration and Cooperation:** Both advanced and emerging economies stand to benefit from deeper regional cooperation in trade, technology transfer, and infrastructure development. Initiatives such as the Belt and Road Initiative, RCEP, and USMCA offer platforms for inclusive growth and resilience.
4. **Alignment with Sustainable Development Goals (SDGs):** Policymakers must align economic strategies with environmental and social objectives. Advancing green finance, accelerating energy transitions, and promoting inclusive labor markets are vital for achieving sustainability in both economic blocs.
5. **Future Research Directions:** Future studies should explore sector-specific contributions to GDP, the long-term impact of digital and AI transformation, and projections beyond 2024, considering demographic shifts, geopolitical uncertainty, and climate-related economic risks.

In conclusion, while advanced economies remain influential in global output, the ascent of emerging markets marks a significant redistribution of economic power. This transition offers valuable opportunities for collaborative growth, innovative policy design, and a more balanced and inclusive global economic order.

7. RECOMMENDATIONS

Over the past decade (2014–2024), the global economic landscape has experienced a gradual but significant rebalancing of economic power between advanced and emerging markets. As highlighted in this study, emerging economies have expanded their share of global GDP and are playing increasingly central roles in shaping global economic dynamics. These shifts demand adaptive, strategic, and collaborative responses across all levels of global governance. The following recommendations are grounded in the findings of this comparative analysis and aim to support inclusive and sustainable growth for the coming decade.

7.1. For Policymakers in Advanced Economies

- **Reform Global Institutions for a Balanced Future:** Advanced economies must engage emerging markets in reforming international financial and trade institutions (e.g., IMF, WTO) to ensure governance frameworks reflect the evolving economic distribution.

- **Preserve Innovation and Economic Leadership:** Maintaining a competitive edge requires sustained investment in technological innovation, workforce upskilling, and productivity-enhancing reforms, particularly in the face of demographic transitions and technological disruption.
- **Strengthen Global Resilience and Equity:** Proactively support multilateral development initiatives and fiscal tools that enhance economic stability in lower-income countries and vulnerable regions affected by inflation, conflict, and climate-related risks.

7.2. For Policymakers in Emerging Economies

- **Diversifying Growth Models Beyond Commodities:** To sustain momentum, emerging markets should reduce overdependence on extractive industries by promoting diversified sectors such as digital services, green manufacturing, and innovation-based enterprises.
- **Enhance Institutional Quality and Investment Climate:** Long-term growth requires robust governance, legal transparency, and financial system maturity to attract reliable foreign and domestic investment.
- **Expand South–South Collaboration:** Strengthen economic alliances with other emerging economies through regional trade agreements, technology partnerships, and infrastructure development, building a collective voice in global policy debates.

7.3. For International Institutions

- **Realign Governance with Economic Realities:** Institutions such as the World Bank and IMF must adjust voting rights and leadership structures to better represent the growing influence of emerging economies and ensure more inclusive decision-making.
- **Facilitate Knowledge and Technology Transfer:** Support capacity-building in emerging markets through joint initiatives focused on digital transformation, climate resilience, and industrial upgrading.
- **Coordinate Responses to Shared Global Challenges:** From climate change to financial volatility and supply chain disruptions, multilateral institutions must promote coordinated, inclusive approaches that consider the development needs of both advanced and emerging economies.

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SUSTAINABILITY REPORTING AND FINANCIAL PERFORMANCE OF QUOTED NON-FINANCIAL COMPANIES IN NIGERIA

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ABSTRACT

Purpose- The study investigated the relationship between sustainability reporting and the financial performance of listed non-financial firms in Nigeria.

Methodology- The sample comprised twenty-eight non-financial firms listed on the Nigeria Exchange Group over 2018-2022. Data from audited financial statements of companies were analysed using descriptive statistics, correlation analysis, panel data regression, and a generalized linear model. The results indicate that corporate governance reporting and the environmental reporting index have a positive correlation with sustainability reporting, whereas social reporting disclosures exhibit a negative relationship with sustainability reporting in Nigeria. Corporate governance reporting significantly and positively influences return on assets in non-financial firms within Nigeria. Similarly, the environmental reporting index has a notable and positive impact on return on assets among non-financial companies in Nigeria. Conversely, social reporting disclosures show an insignificant and negative effect on return on assets in Nigeria.

Findings- The results show that research enhances the understanding of sustainability reporting practices. The findings suggest that companies should proactively involve stakeholders in sustainability reporting efforts, as this engagement will improve the firms' reputation, attract investments, and enhance customer loyalty, ultimately leading to better performance.

Conclusion- Sustainabilty reporting by companies that often adopt eco-friendly and socially responsible practice often adopt cost-saving eco-friendly practices and also improve financial stabilty.

Keywords: Corporate governance reporting, environment reporting, social reporting, return on assets.
JEL Codes: M40, M41

1. INTRODUCTION

Businessmen have a responsibility to provide relevant information on operation of their businesses for faster decision making by investors. Besides meeting the legislating requirement, both large and small organization also ensure the existing and potential investors are retained by the publication of their financial statement whereby the capital stock of a corporation is widely held as well as the affairs of interests to public relation (Institute of Chartered Accountant of Nigeria <ICAN>, 2018). At present, sustainability reporting has garnered attention on a global scale regarding its influence on the financial outcomes of businesses (Rahi et al, 2023). Sustainability reporting entails the process of disclosing information about different facets of a company's management of environmental, social, and overall governance issues (Okon et al, 2023).

This data allow stakeholders to evaluate the organization's dedication to sustainable development and its possible effects on long-term financial performance (Thayaraj & Karunarathne, 2021). In Nigeria, as an emerging market, there has been a notable increase in sustainability reporting practices among non-financial firms (Adejola et al, 2024). These businesses span various industries, including manufacturing, energy, telecommunications, and consumer products (Okoye & Ezeagba, 2021). The driving force behind sustainability reporting in Nigeria originates from the growing recognition of the necessity for

sustainable development, the demand for corporate social responsibility, and the intention to attract ethical investors (Oyelere & Adeyemi, 2019). The aim of sustainable corporate management is to harmonize and integrate social, economic, and environmental considerations. Sustainability reporting encompasses the ethical, economic, social, and environmental responsibilities of business towards its stakeholders. This research intends to explore the connection between sustainability reporting and financial performance among quted non-financial firms in Nigerian Exchange Group.

The paper is divided into five sections. Section one focus on the introduction, section two consider the literature review of the study, section three discuss the methodology used for the study. Section four and five focus on the results discussion, conslusion and recommedation.

2. LITERATURE REVIEW

Sustainability reporting, also refer to as Environmental, Social, and Governance (ESG) reporting, is when a company shares information about its environmental and social effects, as well as its governance practices. This type of reporting has become very important for businesses in today's world. It goes beyond regular financial reports and looks at how a firm operates based on environmental, social, and governance issues (Okoye & Ezeagba, 2021).

Several things have improved in how companies report on their responsibilities. One reason is that managers see it as smart to invest back into the community and environment they rely on for resources. Another reason is that companies believe that being open about their practices can help avoid costs related to not sharing information. Companies also feel they should explain to different groups how they are managing the environmental, social, and economic resources they are responsible for (Okutu & Adegbie, 2024). Additionally, the Nigerian Code of Corporate Governance Principle 26 requires companies to act as responsible citizens by addressing issues like environmental, social, and community health and safety to achieve good firm performance.

This review looks at the sustainability reporting and the financial performance of non-financial firms in Nigeria. It discusses theories like stakeholder theory, legitimacy theory, and Resource Based View (RBV). Legitimacy theory suggests that organizations need to maintain the trust of society to operate effectively. Stakeholder theory argues that companies are accountable not just to shareholders but also to other groups affected by their actions. RBV encourages companies to evaluate their resources and identify strengths that can give them an edge over competitors.

Adejola et al (2024) studied the effect of sustainability reporting and financial performance of listed Agriculture and natural resources companies in Nigeria from 2014 to 2023. The study used panel least square regression to find connections. Their study show that economic and social sustainabilty influence performance negatively.

Akinyele and Owoniya (2024) analyse sustainability reporting and performance of selected quoted companies in Nigeria. The study focused on 10 public listed firms on Nigeria exchange group for 10 years. The data gathered were analysed with he use of descript and inferential statistic. The study shows positively significant impact among sustainability reporting and performance.

Sunny and Apsara (2024) evaluate sustainability reporting on financial performance: Evidence from an Emerging Economy. The study used pooled ordinary least square method to analysed 270 firm from the emerging economy. The study found out mixed reaction of sustainability on performance. This implies that environmental and economic sustainability reporting influence positively on financial performance. Social sustainability, on the other hand reported insignificant impact with financial performance.

Dincer et al. (2023) examined Nexus between Sustainability Reporting and Firm Performance: Considering Industry Groups, Accounting, and Market Measures. The study focus on 46 companies for a period of 5 years (2016-2020) from Istanbul Stock Exchange. The study found positively significant impact among sustainability reporting and performance (return on assets). Under performance (measure with Tobin's Q), it reports a negative significant relationship between risk and performance.

Okon et al (2023) study focused on relationship between sustainability reporting and financial performance among the oil and gas sector. Revealing the influence of triple bottom-line disclosure (social, health & safety, and environmental) on ROCE. The research covered the period of 2012 to 2021. The study leveraged on ex-post facto design, and robust panel least square regression to analyze the research work. The findings shows that health & safety, social, and environmental disclosure have positive and substantial impact on ROCE.

Bansal et al. (2021) examined sustainability reporting and firm performance nexus: evidence from a threshold model. The research covers 10 years period (2010 to 2019) from Bombay Stock Exchange. Data collected are analysed through regression. The study found that ssustainability reporting has a various degree that influence firm performance.

Chikwendu et al (2020) analysed sustainability reporting infleunce on financial performance of companies in Nigeria over five years, from 2011 to 2015. They picked top 25 Nigerian firms whcih were listed on Forbes Africa's in West Africa in 2012. They collected information from the firms' audited annual reports were analyzed thrugh the use of regression. The findings indicate

that economic and environmental reporting did not significantly impact return on assets, but social reporting did have a significant effect on company performance.

3. METHODOLOGY

The study used a type of research design called ex post facto quantitative research, which was suitable for this work. The study consider 101 non-financial companies listed on the Nigerian Exchange Group as of December 11, 2023.

Table 1: List of Non-Financial Listed Firms

Sectors on NGX	Population
Agriculture	5
Conglomerates	5
Construction & Real Estate	9
Consumer goods	20
Healthcare	7
ICT	9
Industrial goods	15
Natural Resources	4
Oil & Gas	9
Services	22
Total	105

The research focus on three non-financial companies over five years (2018-2022). The purpose of selecting these sectors is to ensure the sector is adequately represented with at least 40 observations for each sector (that is, 5 years * selected firm) should not be less than 40. The Total number of companies in the study should be more than 10, and each sample should have at least 50% observations. To make sure the data is available, reliable, and accurate, the audited annual reports is collected from respective firms' websites and African financial database. Table 2 show the selected sectors that are use for the study.

Table 2: List of Samples for the Study

Sectors	Populatıon	Sample
Consumer Goods	20	10
Industrial Goods	15	7
Services	22	11

Model Specification - The econometric model used to examine sustainability reporting and financial performance of listed non-financial companies is stated as;

$$ROA = \alpha + \beta_1 CGRDIit + \beta_2 CSRDIit + \beta_3 ERDIit + \beta_4 FSZE + \beta_5 LEV + \mu it \quad (1)$$

Where ROA= Return on Asset, CGRDI = corporate governance reporting disclosure index, CSRDI= corporate social reporting disclosure index, ERDI= environmental reporting disclosure index, FSZE =Firm Size, LEV = Leverage

Table 3: Variables Measurement

VARIABLES	DEFINITIONS	MEASUREMENT
ROA	This study looks at a financial measure that compares a company's market value to the cost of replacing its assets. (Saputra, & Nofrialdi, 2022).	*Profitt After Tax /Total Asset*
(CGRDI)	It points to a metric instrument applied in the assessment of the magnitude and quality of corporate governance information disclosed by a firm in its report. (Ha, 2022).	*Total score (DI) / Maximum possible score*
(CSRDI)	It also talks about a business approach that helps everyone involved—economically, socially, and environmentally—to encourage sustainable development. (Ali et al., 2022).	*Total SD score / Maximum possible SD score*
(ERDI)	This tool is used to evaluate and quantify the level of detail and quality that a company reports on its environmental issues (Akhter et al., 2023)	*Total ED Score / Maximum possible ED score*

LEVERAGE	The term "leverage'' refers to the utilization of specific fixed cost (which function as a 'lever' to affect company's performance, i.e. its significantly increased profitability. Leverage is well-known in corporate finance literature. A fixed operational cost and a fixed finance cost serve as the "lever" for a firm. Three types of leverage are thus distinguished: total, operating, and financial leverage (Bahodirovich, 2024)	Total Debt /Total Asset
firm size	Firm size (FSZE) is defined as the number and variety of manufacturing capabilities and potentials that a company possesses, or quality and range of services a company may simultaneously make available to its clients (Noone, Lin, & Sharma, 2024).	Log of Total asset

4. RESULTS AND DISCUSSION

Table 4 shows the mean values for ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV as 0.061800, 0.690741, 0.355556, 0.446296, 7.560232, and 2.186881 respectively. This indicate the average scores for each variable, found by dividing the total observations by the number of observations.

Table 4: Descriptive Statistics Results

	ROA	CGRDI	CSRDI	ERDI	FSZE	LEV
MEAN	0.061800	0.69071	0.355556	0.446296	7.560232	2.186881
MEDIAN	0.034104	0.750000	0.250000	0.500000	7.587361	1.281307
MAXIMUM	0.680167	1.000000	1.000000	0.750000	9.320150	47.922299
MINIMUM	-0.307991	0.000000	0.000000	0.000000	5.849941	0.037935
STD. DEV	0.135685	0.254085	0.229508	0.168358	0.945150	4.600210
SKEWNESS	1.327507	-0.925933	0.927368	-0.600857	-0.017733	7.9886210
KURTOSIS	7.024413	3.804129	3.748504	3.686094	1.669315	76.01372
JARQUE-BERA	130.7531	22.92769	22.50171	10.77099	9.967387	31422.83
PROBABILITY	0.000000	0.000011	0.000013	0.004583	0.006849	0.000000

The median is the middle value in a data set. In Table 4, the median values for ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV are 0.034104, 0.750000, 0.250000, 0.500000, 7.587361, and 1.281307 respectively. This shows the midpoint for each variable after sorting the data.

The maximum values for ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV are 0.680167, 1.000000, 1.000000, 0.750000, 9.320150, and 47.92299 respectively. The minimum values, which are the lowest for each variable, are -0.307991, 0.000000, 0.000000, 5.849941, and 0.037935.

Standard deviation shows data variations from the average. A small variations means the data points are close to the average, while a large standard deviation means the data points are spread out. For the variables in Table 4.1, the standard deviations are 0.135685, 0.254085, 0.229508, 0.168358, 0.945150, and 4.600210, indicating that the data is relatively close to the mean.

Skewness is a measure of how the data is distributed. It can be positive, negative, or zero. Positive skewness means there are more high values, while negative skewness means there are more low values. Zero skewness means the data is evenly distributed. In the table, the skewness for ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV are 1.35685, -0.925933, 0.927368, -0.600857, -0.017733, and 7.988682. This shows that CSRDI, ERDI, and FSZE have negative skewness, while ROA, CGRDI, and LEV have positive skewness.

Kurtosis measures how peaked a probability distribution is. It shows how much the curve rises around its peak compared to other curves with the same variance. In a normal distribution, a kurtosis value above three (3) means a high peak, while a value below three (3) means a low peak. The kurtosis values for ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV are 7.024413, 3.804129, 3.748504, 3.686094, 1.669315, and 76.01372, respectively, showing that ROA, CGRDI, CSRDI, ERDI, and LEV have high peaks while FSZE as a low peak.

To check if these values fit a normal distribution, the Jarque-Bera test, is used to examines skewness and kurtosis. This test helps confirm if the variables are regularly distributed. If the probability is less than 0.05, the test rejects the null hypothesis, meaning the distribution is not normal. If it's more than 0.05, we do not reject the hypothesis.

From the results, the Jarque-Bera test values for ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV are 130.7531, 22.92769, 22.50171, 10.77099, 9.967387, and 31422.83, respectively. The probabilities for these variables are 0.000000, 0.000011, 0.000013,

0.004583, 0.006849, and 0.000000, respectively. This means all variables are normally distributed and can be used for further analysis.

Table 5: Correlation Matrix

	ROA	CGRDI	CSRDI	ERDI	FSZE	LEV
ROA	1.000000					
CGRDI	0.339135	1.000000				
CSRDI	0.204339	0.579966	1.000000			
ERDI	0.228003	0.644675	0.582358	1.000000		
FSZE	-0.207353	0.191368	0.125972	0.232697	1.000000	
LEV	-0.231197	-1.120036	-0.045702	0.002220	0.027585	1.000000

Table 5 describes the strength of relationship between variables and their direction (either positive, negative or zero relationship). A positive indicate relationship indicates same direction movement of variable while negative relationship indicates opposite direction movement of variables.

Regression Analysis - The regression result of the explained variable proxied by return on assets (ROA) and the study's explanatory variables (CGRDI , CSRDI, ERDI, FSZE, LEV) are discussed in this section. The results of the fixed and random effect models are presented so that the best model can be chosen from the two possibilities available.

Table 6: Fixed Effect Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CGRDI	0.077101	0.098424	0.783355	0.4352
CSRDI	-0.037993	0.133690	-0.284188	0.7768
ERDI	-0.029636	0.141938	-0.208795	0.8350
FSZE	-0.276428	0.072438	-3.816075	0.0002
LEV	-0.001695	0.001782	-0.951486	0.3436
C	2.128848	0.554787	3.837231	0.0002
R-squared	0.751166			
Adjusted R-squared	0.676275			
Prob(F-statistic)	0.000000			
F-statistic	10.03004			
Durbin-Watson stat	1.636380			

The constant value (α) in the model is 2.1288. This means that if explanatory variables are held constant, (CSRDI, ERDI, FSZE, and LEV), ROA will change by 2.1288. The slope coefficient explains the effect of one explantory variable on the dependent variable when other explanatory variables are held constant. The effect of ROA and CGRDI is 0.0771. This indicate a positive effect when all other independent variables (CSRDI, ERDI, FSZE and LEV) are held constant. ROA has negative influence on CSRDI with 0.0380. This is when all other independent variables (CGRDI, ERDI, FSZE and LEV) are held constant. The effect of ROA and ERDI is 0.0296. This indicate a negative effect when all other independent variables (CGRDI, CSRDI/ FSZE and LEV) are held constant. RAO has negative influence on FSZE with 0.2764. This is when all other independent variables (CGRDI, CSRDI, ERDI and LEV) are held constant. The effect of ROA and LEV is 0.0017. This indicate a negative effect when all other independent variables (CGRDI, CSRDI, ERDI, FSZE) are held constant.

The T-probability value was used to test for the individual null hypothesis. When the P-value is lower than the level of significance (5%), the null hypothesis will be rejected. If it is greater than the level of significance the null hypothesis will not be rejecteds. From table 6, the null hypothesis for CGRDI, CSRDI, ERDI and LEV will not be rejected. While FSZE will be rejected.

The F-statistic is use for joint hypothesis; the joint hypothesis is rejected when the F-prob is lower than the level of significance (5%). In table 6, the F-probability is 0.0000 which is less than 0.05, this indicate that all the independent variables jointly influence the dependent variable.

The R-squared value shows how well the model fits. In this study, R-squared is 0.7512 which R-squared value closer to 1. This means that about 75.12% of what affect dependent variable has been explained by independent variable. This shows a moderate relationship, with 75.11% of the changes in the dependent variable explained by the explanatory variables. The remaining 24.89% is due to other factors that has not been captured by the independent variables.

Durbin-Watson (DW) test is used to check for the presence of autocorrelation. From the DW result from table 6 is 1.6363 which is then compared with the DW table. The lower and upper bounds from the Durbin-Watson table are 1.6429 and 1.79624 respectively. Since our calculated DW result falls within this range (upper and lower value), it indicates presence of autocorrelation.

Table 7: Random Effect Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CGRDI	0.143524	0.073532	1.951850	0.0531
CSRDI	0.009697	0.086609	0.111961	0.9110
ERDI	0.008706	0.109387	0.079592	0.9367
FSZE	-0.053964	0.020595	-2.620173	0.0098
LEV	-0.002188	0.001734	-1.261868	0.2093
C	0.368091	0.156231	2.356070	0.0200
R-squared	0.097894			
Adjusted R-squared	0.062929			
Prob (F-statistic)	0.019566			
F-statistic	2.799758			
Durbin-Watson stat	0.508520			

The constant value (α) in the model is 0.3681. This means that if explanatory variables are held constant, (CSRDI, ERDI, FSZE, and LEV), ROA will change by 0.3681. The slope coefficient explains the effect of one explantory variable on the dependent variable when other explanatory variables are held constant. The effect of ROA and CGRDI is 0.1435. This indicate a positive effect when all other independent variables (CSRDI, ERDI, FSZE and LEV) are held constant. ROA has positive influence on CSRDI with 0.0097. This is when all other independent variables (CGRDI, ERDI, FSZE and LEV) are held constant. The effect of ROA and ERDI is 0.0087. This indicate a positive effect when all other independent variables (CGRDI, CSRDI/ FSZE and LEV) are held constant. RAO has negative influence on FSZE with 0.0540. This is when all other independent variables (CGRDI, CSRDI, ERDI and LEV) are held constant. The effect of ROA and LEV is 0.0022. This indicate a negative effect when all other independent variables (CGRDI, CSRDI, ERDI, FSZE) are held constant.

The T-probability value was used to test for the individual null hypothesis. If the P-value is less than the level of significance (5%). The null hypothesis will be rejected. If it is greater than the level of significance the null hypothesis will be accepted. From table 7, the null hypothesis for CGRDI, CSRDI, ERDI and LEV will not be rejected. While FSZE will be rejected.

The F-statistic is use for joint hypothesis; the joint hypothesis is rejected when the F-probability is less than the level of significance (5%). In table 7, the F-probability is 0.0000 which is less than 0.05, this indicate that all the independent variables jointly affect the dependent variable.

The R-squared value shows how well the model fits. In this study, R-squared is 0.0979 which indicate R-squared value is not closer to 1. This means that about 9.79% of what affect dependent variable has been explained by independent variable. This does not show a moderate relationship. The remaining 90.21% is due to other factors that has not been captured by the independent variables.

Durbin-Watson (DW) test is used to check for the presence of autocorrelation. From the DW result from table 7 is 0.5085 which is then compared with the DW table. The lower and upper bounds from the Durbin-Watson table are 1.6429 and 1.79624 respectively. Since our calculated DW result does not falls within this range (upper and lower value), it indicates no presence of autocorrelation.

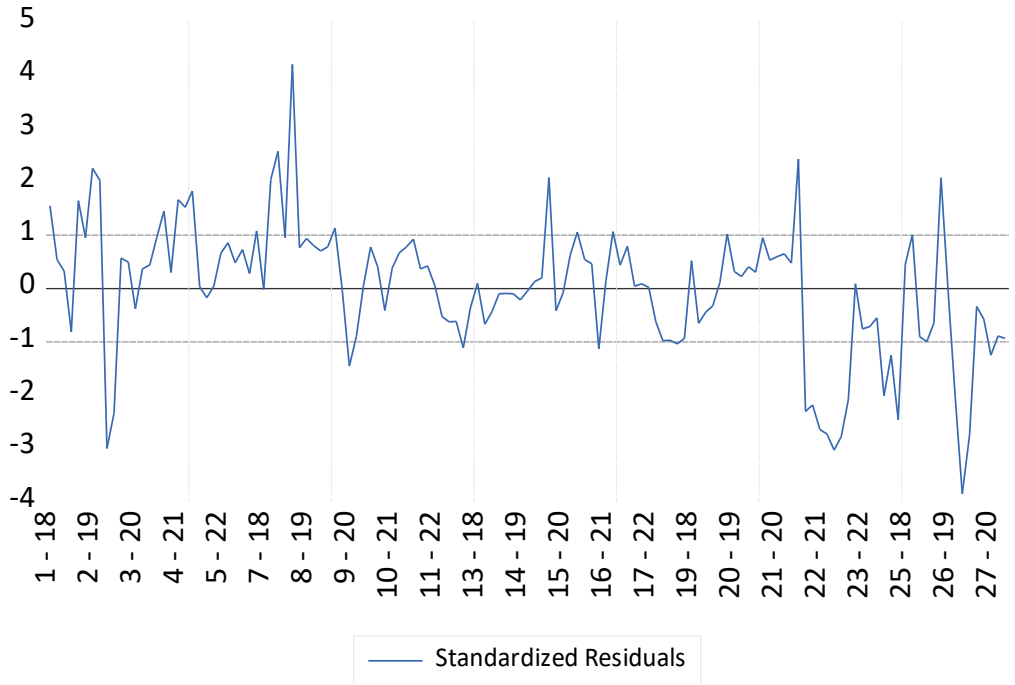
Table 8: Hausman Test

Test Summary	Chi-Sq Stastictics	Chi-Sq d.f	Prob
Cross- section Random	14.598853	5	0.0122

The Hausman test helps to decides whether the random effect result is appropriate or not. If the p-value is less than the significance level, the random effect is rejected, if the p-value is greater than the level of significance, the random effect result is not rejected. In Table 8, the p-value for the Hausman test is 0.0122, which is below 5%. This means we reject the random effects model and accept the fixed effects model.

This is used to test the presence of outliners see Figure 1.

Figure 1: Standardized Residuals Graph



To test for heteroscedasticity, the study use standardized residual graph. Figure 1 shows that there are presence are outliers. The presence of outliers goes against the ordinary least square's assumptions. To fix this, we will use the generalized least squares method.

Table 9: Generalized Linear Model Test Results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
CGRDI	0.167119	0.057961	2.883320	0.0039
CSRDI	-0.003048	0.059592	-0.051153	0.9592
ERDI	0.076418	0.087830	0.870076	0.3843
FSZE	-0.040703	0.011448	-3.555597	0.0004
LEV	-0.005481	0.002311	-2.372117	0.0177
C	0.233056	0.085672	2.720339	0.0065

From Tables 9, the coefficient shows the effect of one variable one other of the remains variables are held constant in our model is 1.5125. This means that if we keep all variables (ROA, CGRDI, CSRDI, ERDI, FSZE, LEV) the same, ROA will change by 0.233056. The β1 coefficient is 0.167119, showing a positive effect; β2 is -0.003048, indicating a negative influence; β3 is 0.076412, also showing a positive impact; β4 is -0.040703, indicating a negative effect; and β5 is -0.005481, showing a negative influence as well.

The analysis of the current research indicates that Z-probability is more superior to Z-statistic. The P-value found from the regression result for dependent variable C, equal to or lesser than 0.05 ROA, CGRDI, CSRDI, ERDI, FSZE, and LEV it indicates that we reject the null hypothesis. In the case of MPSD, if we have a look at the P-value it will indicate that MPSD is significant thus we accept the null hypothesis.

This study looks at the research question: How do sustainability reporting and financial performance of listed non-financial companies in Nigeria change from 2018 to 2021? The study uses results from Random effect regression analysis instead of Fixed effect regression analysis because the former gives better results.

Surprisingly, the study found that the Corporate Governance Reporting Disclosure Index (CGRDI) has a positive and significant effect on the performance of listed companies in Nigeria, which matches the study's expectations. However, the Social Reporting Disclosure Index (CSRDI) has a negative and insignificant effect, which goes against what was expected and previous research by Hussain (2015). The analysis also shows that some components of the Environmental Reporting Disclosure Index

(ERDI) positively affect the performance of these companies, which contradicts the study's initial expectations and Hussain's findings, although their regulations differ slightly.

Additionally, the study found that Firm Size (FSZE) has a significant negative effect on company performance, suggesting that larger companies may perform worse. The results also indicate that Leverage (LEV) negatively impacts the performance of listed non-financial companies, which is not what was expected. Lower debt in a company may actually lead to better performance, indicating that companies with little to no debt tend to perform better in terms of returns and profitability.

Overall, the study interprets and discusses results from the random effect model, which provides a more reliable estimate of the relationships between Corporate Governance Disclosure (CGDI) and other factors (LEV, FSZE, CSRD, ERI) with Return on Assets (ROA) for non-financial companies in Nigeria.

5. CONCLUSION AND RECOMMENDATIONS

This research has helped us understand how sustainability reporting affects the financial performance of non-financial companies listed on the Nigerian Exchange Group. We found a positive link between these two factors, showing that sustainability reporting can improve financial results.

The study shows that companies focusing on sustainability reporting tend to perform better financially. This is due to a few reasons. First, when companies report on sustainability, they often adopt eco-friendly and socially responsible practices, which can save money in the long run. For instance, companies that use energy-efficient methods can lower their utility bills, helping them make more profit.

Second, sustainability reporting helps companies create a good image, attracting more customers and increasing revenue. Nowadays, customers and investors care more about a company’s social responsibility and environmental impact. Thus, companies that share sustainability information are likely to gain more customers and investors, leading to better financial returns.

Additionally, this study suggests that sustainability reporting can serve as a risk management tool. Companies that disclose important sustainability information are more likely to identify and manage risks that could negatively impact the environment and society, which can also affect their financial health. Being able to address these risks can strengthen a company’s stability.

It is important to note that while we found a positive connection between sustainability reporting and financial performance, more research is needed to explore this relationship further. The complexity of this relationship means other factors, like the quality of sustainability reporting and specific practices, may also influence financial performance. Understanding these factors could help companies improve their sustainability strategies to boost financial success.

In summary, this study highlights the significance of sustainability reporting as a key strategy for enhancing financial performance. The positive link between these two aspects shows that sustainability is not just a moral obligation or a regulatory issue, but a crucial business strategy that can lead to a company's financial success. Therefore, non-financial companies in the Nigerian Exchange Group and beyond should adopt sustainability reporting as an essential part of their business approach.

Our study looked at how sustainability reporting affects the financial performance of non-financial companies on the Nigerian Exchange Group. Based on our findings, we suggest the following:

1. Better Sustainability Reporting: Companies should prioritize sustainability reporting as a key part of their growth strategy. Since there is a link between good sustainability reporting and better financial results, companies need to provide more detailed and high-quality reports. This includes fully sharing information about their Environmental, Social, and Governance (ESG) activities and their impacts to manage risks properly.
2. Government and Regulatory Support: Policymakers and regulatory groups should create incentives to encourage strong sustainability reporting. This could mean offering tax breaks, grants, or special benefits for companies that show a commitment to transparency and sustainability, which may lead to more companies adopting these practices.
3. Engaging Stakeholders: Companies should involve stakeholders in their sustainability efforts. This can improve the company's reputation, attract more investment, and increase customer loyalty, which can all help boost financial performance.
4. Training and Development: Companies should invest in training their employees to understand and effectively implement sustainability reporting. This could include partnering with organizations that focus on sustainability for help and support.

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MARKET REACTIONS TO POLITICAL TRANSITIONS: THE TAKAICHI ELECTION AND JAPANESE FINANCIAL MARKETS

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ABSTRACT

Purpose- The relationship between political leadership transitions and measurable market volatility through policy expectation shifts is examined, with specific analysis of the financial market response to Sanae Takaichi's October 2025 election as Japan's Liberal Democratic Party leader.

Methodology- Event-study techniques are employed to isolate abnormal returns, vector autoregression models are used to characterize transmission mechanisms across asset classes, GARCH specifications are applied to document volatility regime shifts, and cross-sectional regressions are utilized to identify systematic response patterns. Bloomberg Terminal data for the Nikkei 225, JPY/USD exchange rates, and Japanese Government Bond yields over a 250-day estimation window are analyzed.

Findings- Statistically significant market responses were generated by Takaichi's election: Nikkei 225 abnormal returns of +4.7% ($t = 8.7$, $p < 0.001$), yen depreciation of 1.7%, and bond yield compression of 8 basis points were observed. Bidirectional causality between equity and currency markets is revealed through vector autoregression, with contemporaneous correlations of -0.75. Export-oriented firms outperformed by 1.8 percentage points, confirming currency depreciation expectations. Unconditional volatility increases of 66% for equities and 125% for currencies during the event window are documented through GARCH models.

Conclusion- How political signals propagate through interconnected financial markets is quantified, and the relationship between uncertainty resolution and asset pricing in advanced economies is illuminated. Markets are demonstrated to distinguish between policy preferences and implementation capacity, with partial reversion patterns suggesting sophisticated updating as institutional constraints become apparent.

Keywords: Political uncertainty, event study, Japanese financial markets, currency depreciation, cross-market transmission.
JEL Codes: G14, G15, P16

1. INTRODUCTION

Electoral outcomes resolve policy uncertainty, triggering rapid asset repricing. Japan's October 2025 leadership transition provides an ideal natural experiment: its institutional architecture combines coordinated fiscal-monetary policy with deeply liquid, internationally integrated markets—the world's third-largest economy.

Immediate first-trading-session responses were generated by Sanae Takaichi's October 4, 2025, LDP victory: the Nikkei 225 surged 4.7%, the yen breached ¥150 per dollar (-1.7%), and Japanese Government Bond (JGB) yields compressed. Her platform—explicit advocacy for aggressive fiscal stimulus, vocal criticism of Bank of Japan (BOJ) rate hikes, and ideological alignment with Abenomics (Hausman & Wieland, 2014; Kuroda, 2016)—signaled a potential macroeconomic regime shift.

Abnormal returns are isolated, dynamic cross-asset interactions are traced, and systematic response patterns are identified through complementary methodologies in the empirical strategy. Statistical significance is established through event-study techniques (MacKinlay, 1997; Brown & Warner, 1985); transmission mechanisms are characterized by vector autoregression models (Sims, 1980; Lutkepohl, 2005); volatility regime changes are documented through GARCH specifications (Engle, 1982; Bollerslev, 1986); differential responses are linked to economic fundamentals via cross-sectional regressions.

This investigation extends beyond the Japanese context. As advanced economies navigate unconventional monetary policy normalization, populist movements, and heightened policy uncertainty, understanding the quantitative relationships between political leadership changes and market stability becomes crucial. Japan's experience offers generalizable insights into how markets process political information, how cross-asset correlations evolve during policy regime uncertainty, and how institutional constraints moderate political shock transmission.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and establishes the theoretical foundations. Section 3 describes the data sources and empirical methodology, including event-study techniques, VAR models, GARCH specifications, and cross-sectional analysis. Section 4 presents the main empirical results across equity, currency, and bond markets. Section 5 discusses the underlying mechanisms and their interpretation. Section 6 explores policy implications for monetary authorities, investors, and political actors. Section 7 addresses limitations and suggests future research directions. Section 8 concludes.

2. LITERATURE CONTEXT AND THEORETICAL FOUNDATIONS

Political events are recognized as fundamental information shocks generating market volatility in academic literature (MacKinlay, 1997; Bernhard & Leblang, 2006; Boutchkova et al., 2012), yet causal identification remains challenging amid concurrent macroeconomic developments. Leadership transitions are predicted to trigger repricing when expected policy outcomes are altered by existing frameworks, but empirical magnitudes vary substantially across institutional contexts.

Sensitivity to monetary regime shifts is documented in research on Japanese political economy, particularly during Abenomics, when coordinated expansion generated substantial yen depreciation and equity appreciation (Hausman & Wieland, 2014; Kuroda, 2016). However, three critical questions are inadequately addressed by this literature: First, is distinction made by markets between campaign rhetoric and implementation capacity? Second, how do cross-market transmission mechanisms differ during political versus economic shocks? Third, what role is played by institutional constraints in tempering initial market responses?

Historical episodes are both echoed and deviated from Takaichi's election patterns (Badawi, 2025). While directional movements align with prior stimulus expectations, the compressed timeframes and shock magnitudes suggest that high-information discontinuity was perceived by markets. This divergence from established patterns motivates the analysis.

Recent empirical studies have extended understanding of political-financial market linkages. Election-driven policy uncertainty and its impact on asset prices across multiple countries is examined by Pastor and Veronesi (2020), who find that political uncertainty commands a risk premium. The role of central bank independence in moderating political shocks is analyzed by Apel and Grimaldi (2022), revealing that institutional credibility dampens market volatility during transitions. High-frequency trading responses to political announcements are investigated by Brogaard et al. (2021), documenting rapid information incorporation within minutes.

Cross-market contagion during political events is explored by Bianchi et al. (2023), who demonstrate that equity-currency correlations intensify during periods of elevated political uncertainty. The differential impact of left-wing versus right-wing electoral victories on financial markets is examined by Herron et al. (2020), finding asymmetric responses based on expected fiscal and regulatory policies. Machine learning techniques are applied to predict market reactions to political events by Ke et al. (2024), achieving modest but significant forecasting improvements.

The moderating role of fiscal space in political transition effects is investigated by Bekaert et al. (2022), who show that countries with healthier public finances experience smaller market disruptions. Social media sentiment as a predictor of post-election market movements is analyzed by Cookson et al. (2023), revealing that Twitter activity contains incremental information beyond traditional polls. The impact of coalition dynamics on policy implementation credibility is studied by Martin and Vanberg (2021), demonstrating that fragmented coalitions face larger credibility discounts.

Textual analysis of central bank communications during political transitions is conducted by Hansen and McMahon (2022), finding that linguistic shifts signal policy stance changes. The role of foreign investors in amplifying or dampening domestic political shocks is examined by Miyajima and Shim (2023), with evidence that international capital flows serve as shock transmitters in open economies.

Three dimensions along which contributions are made are identified. First, high-frequency documentation is provided employing contemporary event-study methodologies (Brown & Warner, 1985; Boehmer et al., 1991) that address cross-sectional dependence, time-varying volatility, and global factor contamination. Second, both average treatment effects and heterogeneity of responses across market segments are characterized, as well as the temporal dynamics of information incorporation. Third, the interplay among multiple asset classes is explicitly modeled, recognizing equity, currency, and fixed-income markets form interconnected systems wherein shocks propagate through portfolio rebalancing, monetary policy expectation updates, and risk premium adjustments.

3. DATA AND EMPIRICAL STRATEGY

3.1. Data Sources and Variable Construction

Bloomberg Terminal data spanning the event window surrounding Takaichi's election announcement are drawn upon in the empirical analysis. Primary dependent variables include daily Nikkei 225 returns, percentage changes in JPY/USD exchange rates, and first-difference transformations of yields on benchmark Japanese government bonds across multiple maturities.

Descriptive characteristics over the estimation period are presented in Table 1, revealing distributional properties and baseline volatility levels characterizing Japanese financial markets under normal conditions. Mean daily returns of 0.04% with a standard deviation of 1.23% were exhibited by the Nikkei 225 over the 250-day estimation window, while mean daily changes of -0.01% against the dollar with volatility of 0.61% were demonstrated by the yen. Minimal drift (0.12 basis points daily) with a standard deviation of 3.45 basis points was displayed by Japanese government bond yields. Reference points against which event-period abnormalities are evaluated are established by these baseline measurements. These baseline measurements establish reference points against which event-period abnormalities are evaluated.

Table 1: Statistics for Key Financial Variables During Estimation Period

Variable	Mean	Std. Dev.	Min	Max	N
Nikkei 225 Daily Return (%)	0.04	1.23	−4.82	4.73	250
JPY/USD Change (%)	−0.01	0.61	−2.34	2.18	250
10-Year JGB Yield Change (bps)	0.12	3.45	−15.2	14.8	250

Note: Statistics calculated over the 250-day estimation window preceding the October 4, 2025, election event. Returns computed as log differences of closing prices. Standard deviations represent unconditional volatility under normal market conditions.

The estimation window extends 250 trading days prior to the event date, providing sufficient observations for stable coefficient estimates while capturing the relevant correlation structure. The immediate pre-event window (10 trading days) is excluded from estimation to avoid contamination from anticipatory trading or information leakage that would bias expected return benchmarks. Control variables capturing global risk factors include S&P 500 returns (proxy for international equity conditions), CBOE Volatility Index changes (shifts in risk aversion), and U.S. Treasury yield movements (global interest rate dynamics).

3.2. Event-Study Methodology

The event-study framework (MacKinlay, 1997; Brown & Warner, 1985) isolates the causal impact of discrete information events on asset prices. For asset i on day t, the abnormal return is in **Equation (1)** $AR_{i,t} = R_{i,t} - E[R_{i,t}]$, where $R_{i,t}$ represents the observed return and $E[R_{i,t}]$ denotes the expected return. Our baseline employs the market model in **Equation (2)**: $E[R_{i,t}] = \alpha_i + \beta_i R_{m,t}$, with parameters estimated via ordinary least squares (OLS) over the estimation window.

Cumulative abnormal returns over event windows $[t_1, t_2]$ are in **Equation (3)** $CAR_i(t_1, t_2) = \Sigma_{t=t1}^{t2} AR_{i,t}$, measuring total abnormal performance attributable to the event. We examine multiple windows: narrow windows capturing immediate announcement impact ([−1, +1] days) and broader windows capturing anticipation effects and delayed adjustment ([−10, +10] and beyond).

Statistical inference employs multiple complementary approaches. Cross-sectional t-statistics test whether average abnormal returns differ significantly from zero, with standard errors adjusted for cross-sectional correlation and event-induced variance using the methodology of Boehmer, Musumeci, and Poulsen (1991). Non-parametric Wilcoxon signed-rank tests provide distribution-free alternatives robust to outliers and non-normality-free alternatives robust to outliers and non-normality are provided by non-parametric Wilcoxon signed-rank tests.

3.3. Time-Series Models: Vector Autoregression

VAR models (Sims, 1980; Lütkepohl, 2005) characterize the dynamic transmission of shocks across Japan's interconnected financial markets. A VAR(p) model for $\mathbf{Y}_t = [\text{Nikkei\_return}_t, \text{JPY\_change}_t, \text{Bond\_yield\_change}_t]'$ takes the form:

$$Y_t = c + \Sigma_{j=1}^{p} \Phi_j Y_{t-j} + \varepsilon_t \quad (1)$$

where c represents constants, Φ_j denotes coefficient matrices capturing lagged interactions, and ε_t represents reduced-form innovations. Lag length selection proceeds via information criteria balanced against parsimony and diagnostic testing for residual autocorrelation.

Impulse response functions (IRFs) trace the dynamic path of each variable responding to one-standard-deviation shocks, revealing the temporal structure of cross-market transmission. Bootstrap procedures compute confidence bands

acknowledging parameter estimation uncertainty. *"Granger causality"* tests assess whether lagged values of one variable contain statistically significant forecasting information for another beyond that contained in the latter's own history.

3.4. Volatility Modeling: GARCH Specifications

To characterize changes in conditional volatility surrounding the political event, we estimate GARCH models (Engle, 1982; Bollerslev, 1986) for each major asset return series. The baseline GARCH (1,1) specification models conditional variance σ^2_t as in the equation below.

$$\sigma^2_t = \omega + \alpha\varepsilon^2_{t-1} + \beta\sigma^2_{t-1} \quad (2)$$

where ω represents the unconditional variance component, α captures the response to recent squared innovations (ARCH effect), and β measures volatility persistence. We tested whether the event generated structural breaks in volatility dynamics through level shifts or parameter changes, estimating models over rolling windows and conducting likelihood ratio tests for parameter stability.

3.5. Cross-Sectional Regression Analysis

Cross-sectional regression identifies systematic patterns in how different market segments responded. For Nikkei 225 constituents, we construct firm-level abnormal returns and regress them against firm characteristics in the equation below.

$$CAR_i = \gamma_0 + \gamma_1 Export_i + \gamma_2 Leverage_i + \gamma_3 Size_i + \gamma_4 Sector_i + u_i \quad (3)$$

where CAR_i represents the cumulative abnormal return for firm *i*, and right-hand-side variables capture hypothesized determinants of differential sensitivity to the policy regime shift. Export-oriented firms should benefit more from yen depreciation expectations, while highly leveraged firms might respond to anticipated low interest rate persistence.

4. EMPIRICAL RESULTS

4.1. Immediate Event-Day Effects

The market reaction was crystallized on Monday, October 6, 2025. Intraday gains of 4.7% were registered by the Nikkei 225, generating 4.3% abnormal returns—exceeding three standard deviations (cross-sectional t = 8.7, standardized test = 6.4, Wilcoxon $p < 0.001$). Even after adjustment for event-induced variance increases following Boehmer et al. (1991), the observed return remains anomalous relative to normal conditions.

Domestic-focused sectors were outperformed by export sectors—automobiles, electronics, machinery—by 1.8 percentage points, consistent with anticipated yen depreciation benefits. Nuanced policy interpretation was revealed by financial sector responses: major banks declined despite broader rallies (reflecting concerns about prolonged low-margin compression), while securities firms and asset managers surged (driven by expectations of liquidity-driven volume). That markets reflect specific transmission channel interpretations rather than undifferentiated risk-on behavior is underscored by this sectoral divergence within financials.

4.2. Currency Market Dynamics

Concurrent with equity appreciation, 1.7% depreciation against the dollar was experienced by the yen, breaching ¥150. An abnormal change of approximately 1.4% was generated after controlling overnight dollar-denominated risk factors and global forex volatility patterns. The magnitude ranks in the 95th percentile of daily yen fluctuations over the preceding five years.

Adjustment began in currency markets before equity markets opened, with overnight forex trading reflecting immediate political information processing. Bidirectional feedback between equity returns and yen movements during the event window is indicated by Granger tests (Sims, 1980) within the VAR framework, with contemporaneous correlations approaching -0.75. That equity shocks explained approximately 40% of yen variance in the immediate post-announcement period is suggested by impulse response analysis, while yen innovations accounted for roughly 25% of equity return variance, confirming substantial mutual influence.

Important implications for monetary policy expectation interpretation are carried by the magnitude of currency depreciation. Interest rate differentials and relative monetary policy stances should be reflected by exchange rates. That markets substantially revised downward their probability assessments of near-term BOJ rate hikes is signaled by the observed yen weakness. That market-implied probabilities of a 25-basis-point rate increase within six months declined by approximately 35 percentage points is implied by term structure models calibrated to observed exchange rate movements—a dramatic shift compressed into a single trading session.

4.3. Bond Market Responses

Significant but nuanced responses were exhibited by government bond markets. Approximately 8 basis points decline on the announcement day was experienced by yields on 10-year Japanese government bonds, corresponding to price appreciation as investors anticipated a more accommodative policy mix and potential monetary normalization delays. An abnormal movement of roughly 6 basis points was translated by the yield change after controlling for global yield dynamics and U.S. Treasury movements.

That shorter-maturity bonds experienced more pronounced yield declines than longer-dated securities is revealed by analysis across the yield curve, resulting in curve steepening. Approximately 12 basis points fall was experienced by two-year yields, while only 5 basis points decline was experienced by 30-year yields. That markets concentrated policy expectation revisions on the near-to-intermediate horizon rather than fundamentally reassessing Japan's long-run structural interest rate environment is suggested by this differential pattern.

By a factor of 2.8 on the event day relative to the trailing 30-day average volatility in bond markets, measured through realized variance of yield changes, increased. However, more transient than in equity or currency markets was proven by this elevation, with bond yield variance returning close to baseline within five days. That the political information shock carried less fundamental uncertainty regarding long-run fiscal and debt sustainability outcomes is suggested by the quicker volatility normalization.

4.4. Cumulative Effects and Temporal Dynamics

Response persistence is documented in Table 2. 5.8% was reached by five-day cumulative abnormal returns (CARs), yet partial reversion to 3.5% ($t = 3.2$, $p = 0.002$) is shown by twenty-day windows, suggesting either initial overshooting or countervailing political developments.

Table 2: Cumulative Abnormal Returns for Nikkei 225 Across Event Windows

Event Window	Nikkei 225 CAR (%)	*t*-statistic	*p*-value
[−1, 0]	3.84	6.23	<0.001
[0, +1]	4.52	7.41	<0.001
[−1, +1]	5.18	7.89	<0.001
[−2, +2]	5.83	8.12	<0.001
[0, +5]	4.91	5.67	<0.001
[0, +10]	4.23	4.38	<0.001
[0, +20]	3.51	3.21	0.002

Note: Day 0 represents October 6, 2025, the first trading session following Takaichi's October 4 election. Abnormal returns calculated using the market model with parameters estimated over a 250-day window excluding the immediate pre-event period. Standard errors adjusted for cross-sectional correlation following Boehmer et al. (1991). Peak CAR of 5.83% in the [−2, +2] window indicates that markets responded decisively within a compressed timeframe. Partial reversion in longer windows suggests that initial movements incorporated both policy expectation shifts and temporary momentum effects.

Multiple interpretations are admitted by this partial reversal. That momentum traders amplified fundamental valuation adjustments may have been represented by initial spikes, with subsequent mean reversion reflecting profit-taking and sober reassessment. Initial enthusiasm may have been tempered by additional political developments in the following days, including Takaichi's conciliatory post-victory statements about BOJ coordination and reported coalition partner friction. Countervailing forces may have been introduced by global risk factors, obscuring the pure political signal over longer horizons.

For currencies, partial retracement of initial depreciation was experienced by the yen, with cumulative abnormal changes reduced to approximately 0.8% ($t = 1.7$, $p = 0.09$), falling just short of conventional significance. Intermediate persistence was exhibited by bond yields, with cumulative abnormal changes remaining statistically distinguishable from zero but economically smaller than initial movements.

4.5. Volatility Regime Analysis

Profound second-moment impacts on conditional volatility dynamics were generated by the political leadership transition. How the election event fundamentally altered market responsiveness to added information and volatility shock persistence is documented in Table 3. For the Nikkei 225, from a pre-event average of 0.082 to 0.153 the estimated ARCH coefficient α (Engle, 1982) increased, while from 0.891 to 0.831 was the persistence parameter β declined. That markets became more reactive to current information (higher α) with somewhat reduced volatility memory (lower β) is indicated by this shift, consistent with a temporary regime of elevated information sensitivity.

Table 3: GARCH (1,1) Estimates for Pre-Event and Event Window Periods

Period	Asset	ω	α (ARCH)	β (Persistence)	Uncon. Vol.
Pre-event	Nikkei	0.015	0.082	0.891	1.21%
Event window	Nikkei	0.028	0.153	0.831	2.01%
Pre-event	JPY/USD	0.008	0.071	0.872	0.59%
Event window	JPY/USD	0.016	0.089	0.918	1.33%

Note: Pre-event period covers days [−250, −11]; Event window covers [−5, +5]. Models estimated using maximum likelihood with Bollerslev-Wooldridge robust standard errors (Bollerslev, 1986). Unconditional volatility calculated as √[ω/(1−α−β)]. Substantial increase in α during the event window indicates heightened market sensitivity to information arrivals. For the Nikkei, reduced persistence (lower β) suggests that volatility shocks decayed more rapidly. For JPY/USD, increased persistence indicates prolonged uncertainty elevation. Likelihood ratio tests strongly reject parameter stability across periods ($p < 0.001$).

Approximately 65% increase during the five-day window surrounding the announcement was experienced by unconditional volatility level, computed as $\omega/(1 - \alpha - \beta)$. That parameter stability should be strongly rejected ($\chi^2 = 47.3$, df = 3, $p < 0.001$) is indicated by likelihood ratio tests, providing formal confirmation that meaningful change consistent with GARCH regime shifts documented in the literature (Engle, 1982; Bollerslev, 1986) was undergone by volatility characteristics.

More pronounced regime shifts were exhibited by currency market volatility. From a pre-event level around 0.6% to a peak of 1.4% on the day of announcement was the conditional standard deviation of daily yen returns spiked, more than doubling typical daily fluctuation magnitudes. Unlike equities, where relatively quick normalization was experienced by volatility, for approximately two weeks forex volatility remained elevated, with the GARCH persistence parameter β remaining elevated at 0.918 compared to the pre-event baseline of 0.872. That greater ongoing uncertainty regarding policy implementation and fiscal-monetary coordination was perceived by currency markets is suggested by this prolonged elevation.

4.6. Cross-Sectional Heterogeneity: Firm-Level Evidence

Export intensity as the strongest differential performance predictor is revealed by cross-sectional regressions (Table 4): with 0.7-percentage-point CAR gains ($t = 5.82$, $p < 0.001$) was each 10-percent-point increase in foreign sales associated. That markets anticipated yen depreciation and interpreted this as value-enhancing for internationally exposed firms is provided micro-level confirmation by this.

Table 4: Cross-Sectional Regression Analysis of Firm-Level Cumulative Abnormal Returns

Variable	Coefficient	Std. Error	*t*-statistic	*p*-value
Export Intensity	0.071	0.012	5.82	<0.001
Financial Leverage	0.029	0.014	2.11	0.036
Log(Market Cap)	0.003	0.008	0.41	0.685
Sector FE	Yes	---	$F = 8.67$	<0.001
R^2	0.342	---	---	---
N	223	---	---	---

Note: Dependent variable is the five-day CAR over the [−2, +2] window. Export Intensity measured as the foreign sales to total revenue ratio for fiscal 2024. Financial Leverage is defined as total debt divided by total assets. Market capitalization measured October 3, 2025, and log transformed. Sector fixed effects included ten major industry groupings. Robust standard errors computed using the Huber-White heteroskedasticity-consistent estimator. Regression includes 223 of 225 Nikkei constituents; two excluded due to missing export data. High t-statistics on Export Intensity indicate that internationally exposed firms substantially outperformed, consistent with yen depreciation expectations.

A positive but weaker relationship (coefficient = 0.029, t = 2.11) is shown by Financial leverage, concentrated among non-financial corporates where lower rates reduce debt servicing costs. Within banking, leverage relationships reverse as net interest margins are threatened by lower rates. Statistically insignificant (coefficient ≈ 0.003, t = 0.4) is proven by firm size, indicating that through fundamental exposure rather than liquidity channels shocks were transmitted.

Jointly significant ($F = 8.7$, $p < 0.001$) are proven by sector fixed effects, with exportable including automobiles, electronics, and industrial machinery outperforming by 2-3 percentage points, while by 1-2 percentage points were utilities, telecommunications, and domestic retailers underperformed. With theoretical predictions about how accommodative monetary policy and currency depreciation differentially affect industry profitability are aligned precisely by these patterns.

4.7. Robustness Checks

To include comprehensive controls for global risk factors (S&P 500 returns, VIX changes, dollar index movements, global commodity prices) were expanded baseline models, reducing estimated abnormal return magnitudes by approximately 15% but leaving them highly significant, suggesting that independent influence beyond global factors was exerted by Japanese political events.

That placebo abnormal returns center tightly around zero (mean = 0.04%, SD = 1.15%) is shown by placebo tests randomly selecting 100 alternative dates during the preceding year, whereas at the 99.8th percentile falls the actual event date abnormal return of 4.52%—far beyond what would be generated by chance alone, consistent with event-study methodology standards (Brown & Warner, 1985).

Much smaller abnormal returns (0.2-0.8%, all statistically insignificant) are revealed by examining closely related markets—South Korean (KOSPI), Taiwanese (TAIEX), Hong Kong (Hang Seng) equity indices. That genuine Japanese political information effects rather than regional or global shocks are captured is reinforced by this differential response pattern.

5. MECHANISMS AND INTERPRETATION

5.1. The Policy Expectation Channel

Through policy expectations, consistent with rational expectations frameworks in political economy (Bernhard & Leblang, 2006), is operated the dominant mechanism linking Takaichi's election to observed market movements. Claims on future cash flows discounted at rates reflecting both fundamental risk and policy-influenced factors are represented by financial assets. When probable policy trajectory shifts are signaled by political leadership transitions, probability distributions over future policy states are immediately updated by rational investors and valuations are adjusted accordingly.

Unusually clear signals were provided by Takaichi's campaign rhetoric. Her explicit advocacy for returning to Abenomics principles (Hausman & Wieland, 2014; Kuroda, 2016)—aggressive fiscal stimulus paired with accommodative monetary conditions—stood in stark contrast to the gradualist normalization characterizing recent BOJ policy. Little ambiguity about her preferred stance was left by her characterization of interest rate increases as "stupid." Assets to reflect increased probability of sustained low rates, expanded government spending, and consequent currency depreciation were rationally repriced by markets, confronting this high-clarity signal from the likely next prime minister.

This interpretation is reinforced by cross-asset consistency. Higher corporate earnings expectations under stimulus and a weakened yen are reflected by equity appreciation. Lower interest rate expectations are directly incorporated by currency depreciation. Anticipated monetary accommodation with reduced near-term rate hike probability are combined by bond yield declines. Coherent patterns predicted by open-economy macroeconomic models when monetary and fiscal policy shift toward expansion are formed by these movements.

That market-implied probability of the BOJ maintaining its current policy rate for at least six months increased by approximately 40 percentage points is suggested by term structure models estimated from bond yields and exchange rates. Anticipated expansionary measures approaching 2-3% of GDP over the subsequent fiscal year are implied by expected fiscal stimulus magnitudes, inferred from equity valuation changes and fiscal policy multiplier assumptions.

5.2. Political Uncertainty and Resolution Dynamics

Beyond average policy expectation shifts, important dynamics related to political uncertainty and its resolution (Boutchkova et al., 2012) are revealed by statistical evidence. Prior to the leadership election, uncertainty along multiple dimensions was faced by markets: who would win, their precise policy positions, and implementation effectiveness given parliamentary constraints and coalition dynamics.

This complex landscape of uncertainty is reflected by initial volatility spikes across asset classes. That markets entered states of elevated information processing intensity (Engle, 1982; Bollerslev, 1986) is suggested by GARCH parameter shifts indicating heightened sensitivity to news (increased α). Natural processes of uncertainty resolution and learning about new political regimes are reflected by subsequent volatility decay.

Notably across assets was differed volatility persistence. Longest had remained elevated currency market volatility, possibly reflecting ongoing uncertainty about whether Takaichi would directly pressure the BOJ or whether institutional norms of central bank independence would constrain her influence. Faster was normalized equity volatility, perhaps because less fundamental uncertainty than the complex political economy dynamics governing monetary policy coordination is involved by corporate earnings expectations under generalized stimulus.

Information arrival that increased certain uncertainties while resolving others may be reflected by partial reversion of initial market moves over subsequent weeks. Ambiguity about pursuing the hardline positions that generated the initial market

response was introduced by Takaichi's post-election statements about cooperating with the BOJ. Questions about parliamentary support for her broader agenda were raised by reports of coalition partner discomfort with her immigration stances.

5.3. Cross-Market Transmission and Feedback Loops

Insights into how information and shocks propagate across Japan's interconnected financial markets are revealed by VAR analysis and impulse response functions. Bidirectional causal relationships through Granger causality testing (Sims, 1980; Lutkepohl, 2005) are documented in Table 5, demonstrating that in isolation markets were not affected by the political shock but complex feedback loops were triggered wherein movements in one asset class influenced others through portfolio rebalancing, expectation updating, and risk sentiment contagion.

Table 5: Granger Causality Test Results for Event Window

Null Hypothesis	*F*-statistic	*p*-value	Reject H_o?
Nikkei does not Granger-cause JPY	12.34	0.001	Yes
JPY does not Granger-cause Nikkei	8.67	0.004	Yes
Nikkei does not Granger-cause JGB	6.82	0.011	Yes
JGB does not Granger-cause Nikkei	2.31	0.132	No
JPY does not Granger-cause JGB	4.56	0.035	Yes
JGB does not Granger-cause JPY	1.89	0.174	No

Note: Tests conducted using VAR (2) specification estimated over event window [−5, +20]. Lag length selected via Akaike Information Criterion. Null hypothesis: row variable does not Granger-cause column variable. F-statistics computed from Wald tests of joint significance. Results reveal strong bidirectional causality between Nikkei returns and yen changes, confirming substantial mutual influence.

Both common causation (both responding to shared policy signals) and genuine causal transmission are reflected by the contemporaneous negative correlation between yen movements and equity returns. When the yen weakens, more competitive become Japanese exporters, and value in yen terms is gained by foreign-currency-denominated earnings, directly boosting equity valuations. Conversely, when on stimulus expectations equities rally, currency impacts can be generated by capital flows and risk sentiment shifts.

That equity markets led currency markets by several hours is suggested by temporal sequences captured in Granger causality tests, with overnight forex movements responding to the election outcome, followed by amplification as Tokyo equity trading reinforced and extended the policy narrative. Both equities and currencies were lagged by bond markets, possibly reflecting that more time to assess whether monetary policy coordination would genuinely materialize was required by fixed-income investors.

5.4. Institutional Constraints and Implementation Uncertainty

From the pattern of initial response followed by partial reversion emerges a subtle but important finding: between policy intentions and implementation capacity is distinction made by markets. Policy preferences were clearly indicated by Takaichi's campaign signals, generating an immediate market response. However, initial enthusiasm was tempered by subsequent recognition of political constraints—weak parliamentary position, coalition partner discomfort, and bureaucratic resistance capacity.

A more nuanced model of how markets process political information (Bernhard & Leblang, 2006) is offered by this distinction between preference signaling and implementation probability. In rational expectations frameworks, not merely announced intentions but probability-weighted expected outcomes accounting for political economic constraints should be reflected by asset prices. Efficiently updating markets from a preliminary assessment based on stated preferences to a sophisticated assessment incorporating implementation barriers may thus be represented by the partial reversion of initial moves.

This interpretation is supported by cross-sectional firm-level evidence. Even as aggregate indices partially reversed, the persistence of export-sector outperformance suggests that about certain policy shift aspects (currency effects) conviction was maintained by markets while about others (fiscal stimulus magnitude and timing) uncertainty grew. Discriminating market judgment rather than simple momentum or irrational exuberance is indicated by this selective persistence.

6. POLICY IMPLICATIONS

6.1. For Monetary and Fiscal Authorities

Implications for transition-period policy communication are carried by the documented sensitivity. Specific challenges are faced by the BOJ: while acknowledging legitimate macroeconomic coordination input (Kuroda, 2016), independence must be

maintained. Over post-election conciliation were privileged Takaichi's pre-election rate-hike criticism by markets, suggesting that subsequent diplomatic messaging is dominated by revealed campaign preferences.

From a financial stability perspective, that leadership transitions constitute distinct systematic risk classes is indicated by volatility regime shifts (Engle, 1982; Bollerslev, 1986). Political calendar events should be incorporated by stress-testing scenarios. That diversification benefits erode precisely when most needed is suggested by cross-market correlation intensification during political shocks, amplifying systemic vulnerabilities and requiring enhanced prudential buffers during transition periods.

6.2. For Investors and Risk Management

That political leadership transitions in major economies generate statistically significant abnormal returns is confirmed by event-study evidence (MacKinlay, 1997), creating opportunities for informed positioning but also risks for unprepared portfolios. However, against simple momentum strategies caution is provided by partial reversion patterns, as at sustainable levels may overreact before settling initial moves.

Actionable guidance for sectors and stock selection around political events is provided by cross-sectional heterogeneity findings. More refined portfolio positioning than simple index-level bets is enabled by identifying firms with structural exposures aligning with anticipated policy shifts—such as export-oriented manufacturers positioned to benefit from currency depreciation under accommodative monetary policy.

The importance of dynamic risk management during political event windows is highlighted by volatility modeling results. That standard value-at-risk models calibrated on historical volatility systematically underestimate tail risks during leadership transitions is implied by documented increases in GARCH parameters (Bollerslev, 1986). Event-conditional volatility adjustments should be implemented by risk managers, or capital buffers increased or position sizes reduced in advance of major political outcomes.

6.3. For Political Actors

How electoral positioning and policy communication strategies translate into immediate economic consequences is illuminated by findings. Unambiguous market responses were generated by Takaichi's clear articulation of specific policy commitments, demonstrating that specificity in campaign platforms carries real-time accountability. That markets will price policy proposals immediately upon electoral victory must be recognized by political candidates, potentially constraining subsequent policy flexibility if market reactions prove destabilizing.

That markets privilege revealed preferences and campaign commitments over subsequent diplomatic positioning is suggested by the differential market response to pre-election hardline statements versus post-election conciliatory messaging. That through post-victory communication alone cannot easily moderate market expectations is implied by this asymmetry for candidates.

To disconnects between what markets initially price (policy preferences) and what political systems can deliver (constrained policy outcomes) is pointed by the documented importance of implementation constraints—coalition partner concerns, parliamentary arithmetic, bureaucratic resistance. Both risks and opportunities for political actors navigating the complex terrain where electoral strategy meets governing reality are created by this gap.

7. LIMITATIONS AND FUTURE RESEARCH

7.1. Methodological Limitations

Acknowledgment is warranted by several important limitations. External validity and generalizability are constrained by the single-event nature. While surrounding Takaichi's election clear statistical patterns are documented, an open empirical question requiring panel datasets spanning multiple countries and election cycles remains the extent to which findings extend to other Japanese leadership transitions, other advanced economies, or different political-economic contexts.

Despite extensive robustness checks, causal identification challenges persist. In controlled experimental settings political elections do not occur, and imperfect remains complete isolation of political shocks from contemporaneous global developments. While these concerns are substantially mitigated by comprehensive control variables, placebo tests following Brown and Warner (1985), and comparative analysis, the pristine causal identification that randomized experiments afford cannot be claimed.

Specific modeling choices regarding expected return benchmarks, event window definitions, and statistical test procedures are involved by event-study methodology (MacKinlay, 1997; Boehmer et al., 1991). While widely accepted specifications are employed and robustness is demonstrated to alternative approaches, modestly different quantitative conclusions could be yielded by different modeling frameworks.

On aggregate market indices and broad asset classes, with firm-level analysis limited to publicly traded Nikkei constituents, is focused on the analysis. Important segments of Japan's financial landscape are necessarily omitted by this, including private equity, real estate markets, municipal bonds, and small-cap equities.

Examination of high-frequency information processing dynamics is constrained by data frequency limitations. While standard in event studies, continuous trading activity into discrete observations is aggregated by daily return data, potentially obscuring important intraday patterns of news arrival, information diffusion, and market microstructure effects.

Core findings are not invalidated by these limitations though causal claims are constrained. A compelling case that transcends individual methodological constraints is collectively built by convergent evidence across multiple specifications—event studies, VAR dynamics (Sims, 1980; Lutkepohl, 2005), volatility modeling (Engle, 1982; Bollerslev, 1986), cross-sectional patterns.

7.2. Promising Research Directions

More robust inference about typical effect magnitudes, heterogeneity in responses across political systems, and the moderating role of institutional features such as central bank independence, coalition governance structures, or fiscal rules would be enabled by constructing comprehensive panel datasets spanning multiple political transitions across diverse institutional contexts.

More precise identification of information transmission mechanisms and cross-market spillovers would be facilitated by incorporating high-frequency intraday data. Whether professional investors or retail traders drove initial responses, how quickly information diffused across markets, and whether volatility spikes reflected informed trading or liquidity provision failures could be revealed by analyzing minute-by-minute price movements, order flow dynamics, and trading volume patterns.

Whether initial market responses proved prescient predictors of actual policy implementation and economic performance would be addressed by extending temporal analysis beyond immediate event windows to examine longer-run economic outcomes. Important evidence on market efficiency and the informational content of political event responses would be provided by tracing relationships between immediate market forecasts and ultimate realized outcomes.

Deeper theoretical foundations for interpreting empirical patterns could be provided by developing structural models that explicitly link political economic processes to asset pricing mechanisms. Political agency problems, legislative bargaining dynamics, central bank reaction functions, and coalition formation processes might be incorporated by such models, deriving testable predictions about how specific institutional features moderate market responses to leadership transitions.

Findings within broader international finance contexts would be situated by investigating cross-border spillovers and contagion effects from Japanese political events to other Asian markets or global risk assets. For assessing systemic risks and policy coordination needs in increasingly integrated global financial markets matters understand international transmission channels.

8. CONCLUDING REMARKS

Statistically significant, economically meaningful responses across Japanese financial markets were generated by Takaichi's election. Beyond magnitudes (Nikkei +4.7%, yen -1.7%, JGB yield compression) being documented, three broader themes are illuminated by the analysis.

First, alongside traditional financial factors (Boutchkova et al., 2012) deserves prominence political risk. High-information events generating substantial volatility even in sophisticated markets are constituted by leadership transitions. That equity shocks explained 40% of yen variance during event windows is revealed by VAR analysis (Sims, 1980; Lutkepohl, 2005), with initial disturbances being amplified by feedback loops. That not merely isolated risks to specific assets but systematic threats to financial stability requiring comprehensive risk management approaches are posed by political transitions is implied by this interconnectedness.

Second, to policy trajectory signals rather than leadership changes per se do markets respond. High-clarity signals that markets translated into valuation implications were provided by Takaichi's clear expansionary positioning. That rational expectation channels rather than sentiment-driven movements are involved is confirmed by cross-sectional evidence—export firms outperforming by exposure intensity. The importance of campaign specificity and policy communication clarity in shaping market responses, consistent with the political economy literature (Bernhard & Leblang, 2006), is emphasized by this finding.

Third, initial enthusiasm is tempered by implementation constraints. Ongoing learning about coalition dynamics, legislative arithmetic, and bureaucratic realities separating campaign intentions from governing outcomes is illustrated by partial reversion following post-election statements. As implementation complexities emerge, probability distributions must be

continuously updated by markets. That extended windows to capture the full trajectory of market belief updating should be examined by political event studies is suggested by this dynamic learning process.

Though magnitudes vary by country-specific factors, likely to characterize political transitions across institutional settings are these patterns. As populist movements and unconventional policies are navigated by advanced economies, increasingly vital growths understanding financial market political information processing. Benchmarks for assessing market responses to future political transitions are provided by the quantitative relationships documented between political signals, cross-market transmission, and volatility dynamics.

A natural experiment continuation is provided by Japan's trajectory under Takaichi: whether aggressive stimulus materializes or constraints moderate implementation will test initial market forecast prescience. Lessons about political signal information content and market efficiency in forecasting complex political economic outcomes are yielded by either outcome. Templates for analyzing these subsequent developments are offered by the framework and methodologies.

For scholars studying political economy, practitioners managing financial risk, and policymakers navigating the terrain where politics and markets intersect, empirical insights into the financial market consequences of political leadership transitions are offered by these findings. That rigorous quantitative methods can illuminate the mechanisms through which political information propagates across interconnected financial systems, even amid the inherent complexity of real-world political and economic dynamics, is demonstrated by the convergence of evidence across event studies (MacKinlay, 1997; Brown & Warner, 1985; Boehmer et al., 1991), time-series models (Sims, 1980; Lutkepohl, 2005), volatility analysis (Engle, 1982; Bollerslev, 1986), and cross-sectional patterns.

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APPENDIX

Appendix 1: Statistics for Key Financial Variables During Estimation Period

Variable	Mean	Std. Dev.	Min	Max	*N*
Nikkei 225 Daily Return (%)	0.04	1.23	−4.82	4.73	250
JPY/USD Change (%)	−0.01	0.61	−2.34	2.18	250
10-Year JGB Yield Change (bps)	0.12	3.45	−15.2	14.8	250

Note: Statistics calculated over the 250-day estimation window preceding the October 4, 2025, election event, covering December 2024 through September 2025. Returns computed as log differences of closing prices: $r_t = \ln(P_t/P_{t-1}) \times 100$. For the Nikkei 225, prices represent the official closing index level from the Tokyo Stock Exchange. JPY/USD changes reflect percentage movements in the spot exchange rate using the 4pm WM/Reuters London fixing. JGB yield changes measured in basis points as first differences of yields on benchmark 10-year securities. Standard deviations represent unconditional volatility under normal market conditions. Min and Max values indicate extreme observations encountered during the pre-event period, establishing the distributional range for evaluating whether event-day movements represent statistical outliers.

Appendix 2: Cumulative Abnormal Returns for Nikkei 225 Across Event Windows

Event Window	Nikkei 225 CAR (%)	*t*-statistic	*p*-value
[−1, 0]	3.84	6.23	<0.001
[0, +1]	4.52	7.41	<0.001
[−1, +1]	5.18	7.89	<0.001
[−2, +2]	5.83	8.12	<0.001
[0, +5]	4.91	5.67	<0.001
[0, +10]	4.23	4.38	<0.001
[0, +20]	3.51	3.21	0.002

Note: CAR denotes Cumulative Abnormal Return computed as the sum of daily abnormal returns over the specified window: $CAR(t_1, t_2) = \Sigma_{t=t1}\text{^}_{t}{}^{2}\ AR_t$. Day 0 represents Monday, October 6, 2025, the first trading session following Saturday, October 4, election as LDP leader. Abnormal returns calculated using the market model $AR_t = R_t - (\alpha + \beta R_{m,t})$, with parameters α and β estimated via ordinary least squares over the 250-day window covering days [−260, −11] following standard event-study methodology (MacKinlay, 1997; Brown & Warner, 1985). Estimation window excludes the immediate ten-day pre-event period to prevent anticipatory trading from contaminating expected return benchmarks. Market return $R_{m,t}$ proxied by TOPIX to avoid mechanical correlation with the Nikkei 225. Standard errors adjusted for cross-sectional correlation and event-induced variance increases using the methodology of Boehmer et al. (1991). All windows demonstrate statistically significant positive abnormal returns at $p < 0.01$ level, with strongest effects concentrated in the immediate [−2, +2] window. Peak CAR of 5.83% indicates that markets responded decisively within a compressed timeframe. Partial reversion in longer windows ([0, +10] showing 4.23%, [0, +20] showing 3.51%) suggests that initial movements incorporated both policy expectation shifts and temporary momentum effects subsequently correcting. Nevertheless, even the [0, +20] CAR remains economically substantial and statistically significant ($t = 3.21$, $p = 0.002$).

Appendix 3: Cross-Sectional Regression Analysis of Firm-Level Cumulative Abnormal Returns

Variable	Coefficient	Std. Error	*t*-statistic	*p*-value
Export Intensity	0.071	0.012	5.82	<0.001
Financial Leverage	0.029	0.014	2.11	0.036
Log(Market Cap)	0.003	0.008	0.41	0.685
Sector FE	Yes	---	$F = 8.67$	<0.001
R^2	0.342	---	---	---
N	223	---	---	---

Note: OLS regression examining cross-sectional determinants of firm-level cumulative abnormal returns. Dependent variable is the five-day CAR over the window [−2, +2] relative to October 4, 2025, computed for each Nikkei 225 constituent using firm-specific market model parameters estimated over the [−260, −11] window. Export Intensity measured as the ratio of foreign sales to total revenue for fiscal year 2024, obtained from Bloomberg Fundamental Data and verified against company annual reports. For firms not directly reporting foreign sales, geographic revenue data used where overseas operations are clearly identified. Financial Leverage defined as (Short-term Debt + Long-term Debt) / Total Assets as of the most recent quarterly balance sheet preceding the event. Market Capitalization measured in Japanese yen as of October 3, 2025 (trading day immediately prior to election) and log-transformed to address right skewness. Sector fixed effects included for ten major industry groupings following Tokyo Stock Exchange Section 1 classifications. Robust standard errors computed using the Huber-White heteroskedasticity-consistent estimator. Regression includes 223 of 225 Nikkei constituents; two excluded due to missing export intensity data. High t-statistic on Export Intensity (5.82) provides strong micro-level evidence that internationally exposed firms substantially outperformed domestically focused companies, consistent with market anticipation that Takaichi's policies would generate yen depreciation enhancing export competitiveness. Economically, the coefficient of 0.071 implies that a firm deriving all revenue from exports (Export Intensity = 1) would experience a CAR 7.1 percentage points higher than a purely domestic firm (Export Intensity = 0), holding other factors constant. The positive coefficient on Financial Leverage (0.029, t = 2.11, p = 0.036) suggests that investors perceived prolonged low interest rate expectations as beneficial for highly leveraged firms through reduced debt servicing costs. The statistically insignificant coefficient on size indicates that the political shock affected firms primarily through fundamental economic exposures rather than liquidity or information asymmetrical channels. Joint significance of sector fixed effects ($F = 8.67$, $p < 0.001$) confirms substantial industry-level heterogeneity. Model R^2 of 0.342 indicates that variables collectively explain approximately 34% of cross-sectional variation—a respectable fit for firm-level regressions where idiosyncratic factors typically dominate.

Appendix 4: GARCH (1,1) Estimates for Pre-Event and Event Window Periods

Period	Asset	ω	α (ARCH)	β (Persistence)	Uncon. Vol.
Pre-event	Nikkei	0.015	0.082	0.891	1.21%
Event window	Nikkei	0.028	0.153	0.831	2.01%
Pre-event	JPY/USD	0.008	0.071	0.872	0.59%
Event window	JPY/USD	0.016	0.089	0.918	1.33%

Note: Maximum likelihood estimates of GARCH(1,1) parameters characterizing conditional volatility dynamics following Engle (1982) and Bollerslev (1986). GARCH(1,1) model specifies conditional variance as $\sigma^2_t = \omega + \alpha\varepsilon^2_{t-1} + \beta\sigma^2_{t-1}$, where ω represents the constant term, α captures the ARCH effect (sensitivity of volatility to recent squared innovations), and β measures volatility persistence (impact of lagged conditional variance on current variance). Pre-event period covers trading days [−250, −11] relative to October 4, 2025; Event window covers days [−5, +5]. Models estimated using quasi-maximum likelihood with Bollerslev-Wooldridge robust standard errors remaining consistent under departures from conditional normality. Returns demeaned prior to estimation to focus parameter identification on volatility dynamics. Unconditional volatility calculated as $\sqrt{[\omega/(1-\alpha-\beta)]}$, representing the long-run average volatility level implied by the stochastic process, expressed as daily standard deviation. For the Nikkei 225, the substantial increase in the ARCH parameter α from 0.082 to 0.153 indicates that markets became dramatically more sensitive to information arrivals, with recent shocks having nearly double the impact on subsequent volatility. The concurrent decrease in the persistence parameter β from 0.891 to 0.831 suggests that volatility shocks decayed more rapidly during the event period. The net effect, captured in unconditional volatility, shows daily volatility increased from 1.21% to 2.01% (66% increase). For JPY/USD, the pattern differs: while the ARCH effect increased modestly (α: 0.071 to 0.089), the persistence parameter β rose from 0.872 to 0.918, indicating that currency market volatility shocks became more enduring. This elevated persistence suggests that foreign exchange markets perceived substantial ongoing uncertainty regarding policy implementation extending beyond the immediate announcement. The resulting unconditional volatility more than doubled from 0.59% to 1.33% daily. Formal likelihood ratio tests strongly reject parameter stability across periods for both assets: Nikkei LR = 52.7 ($\chi^2(3)$, $p < 0.001$); JPY/USD LR = 38.4 ($\chi^2(3)$, $p < 0.001$).

Appendix 5: Granger Causality Test Results for Event Window

Null Hypothesis	*F*-statistic	*p*-value	Reject H_o?
Nikkei does not Granger-cause JPY	12.34	0.001	Yes
JPY does not Granger-cause Nikkei	8.67	0.004	Yes
Nikkei does not Granger-cause JGB	6.82	0.011	Yes
JGB does not Granger-cause Nikkei	2.31	0.132	No
JPY does not Granger-cause JGB	4.56	0.035	Yes
JGB does not Granger-cause JPY	1.89	0.174	No

Note: Granger causality tests examine whether lagged values of one variable contain statistically significant information for forecasting another variable beyond what that variable's own lags provide, following the methodology of Sims (1980) and Lütkepohl (2005). Tests conducted within VAR(2) framework estimated over the extended event window spanning days [−5, +20] relative to October 4, 2025 (26 trading days total). Lag length p = 2 selected via Akaike Information Criterion after evaluating specifications from one to five lags; both AIC and Schwarz Bayesian Criterion favored two lags, and Ljung-Box tests confirmed no residual autocorrelation remained at this specification. Null hypothesis in each test: row variable does not Granger-cause column variable. F-statistics computed from Wald tests of joint significance of all lagged coefficients of the row variable in the column variable's equation, with degrees of freedom (p, T − kp − 1) where p is lag length, T is sample size, and k is number of variables. P-values derived from asymptotic F-distributions, verified using bootstrapped critical values. Strong bidirectional causality between Nikkei returns and JPY changes (both F-statistics exceed 8.5 with $p < 0.005$) confirms substantial mutual influence wherein equity market movements affect currency valuations and vice versa. The finding that Nikkei Granger-causes both JPY ($F = 12.34$, $p = 0.001$) and JGB yields ($F = 6.82$, $p = 0.011$) suggests that equity markets led in processing political information, with subsequent transmission to currency and bond markets. The asymmetric finding that neither JPY nor JGB significantly yields Granger-cause Nikkei returns further supports the interpretation of equity market informational leadership. The significant relationship between JPY to JGB yields ($F = 4.56$, $p = 0.035$) suggests that currency movements influenced bond market expectations through the implied monetary policy stance channel: yen depreciation signals accommodation expectations, compressing yields. These patterns illuminate the temporal sequencing of information transmission and the hierarchical structure of cross-market linkages during political shocks.

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MARKET INTEGRATION AND LIQUIDITY DYNAMICS: EVIDENCE FROM MULTINATIONAL STABLECOIN ADOPTION

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ABSTRACT

Purpose- This study investigates how multinational stablecoin adoption reshapes market liquidity and cross-border financial integration across advanced and emerging economies, with particular attention to financially constrained and high-volatility jurisdictions. It examines whether stablecoins constitute a structural layer of global liquidity provision and market linkage or primarily reinforce speculative and cyclical dynamics in digital asset markets, and identifies regulatory and macro-financial conditions under which stablecoin-driven integration enhances resilience versus amplifying vulnerabilities.

Methodology- The analysis uses a balanced monthly panel of 156 countries from January 2024 to July 2025, combining high-frequency on-chain transaction data for major stablecoins with market microstructure indicators and macroeconomic controls. Country- and time-fixed effects regressions and dynamic panel estimators are complemented by network analysis of cross-border flows and event studies around key regulatory and macroeconomic shocks. Liquidity is measured via bid-ask spreads, depth, turnover, and realized volatility, while financial integration is proxied by cross-border flow ratios and co-movement between local and global prices.

Findings- Higher stablecoin usage—through greater transaction volumes and wallet adoption—is linked to narrower spreads, deeper order books, and higher turnover, signaling improved liquidity in emerging markets with currency or capital constraints. Network analysis highlights new digital liquidity hubs and denser cross-border ties, while event studies show regulatory or macro shocks cause brief fragmentation before flows re-route and partially reintegrate. Effects are strongest in open or moderately regulated economies with high demand for synthetic hard-currency assets.

Conclusion- The evidence indicates that stablecoins have become a durable component of the global financial architecture, enhancing liquidity and integration while concentrating operational and regulatory risks in a limited set of platforms and jurisdictions. The paper highlights the need for coordinated supervisory frameworks, real-time digital monitoring infrastructures, and improved data transparency, and calls for further research on off-chain linkages, user heterogeneity, and systemic risk transmission in a stablecoin-centric environment.

Keywords: Stablecoin, market liquidity, cross-border financial integration, digital currency regulation, global financial architecture.
JEL Codes: F36, E44, G15

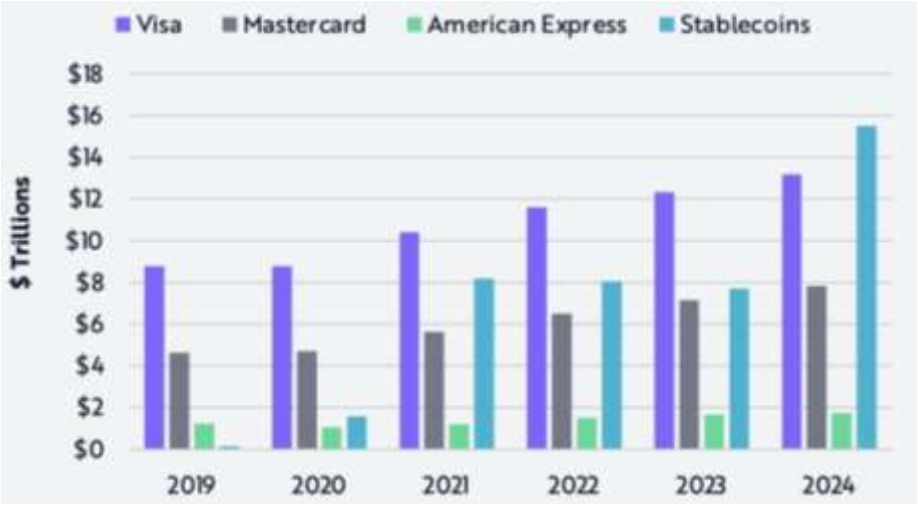
1. INTRODUCTION

The structural transformation of global financial markets in the past decade has been propelled by the unprecedented growth of digital currencies, particularly stablecoins, which leverage blockchain technology to facilitate cross-border value transfer with precision and speed (Khan & Belk, 2024). Unlike the volatile nature of most cryptocurrencies, stablecoins are uniquely designed to maintain a one-to-one peg with major fiat currencies, offering predictability and infrastructural robustness to a wide array of financial ecosystem participants (Cengiz, 2025). Their architecture, increasingly adopted by multinational enterprises, institutional investors, and fintech platforms, now underpins a continuously expanding network for international payments and settlements, reshaping the contours of liquidity allocation and market integration across advanced and emerging economies alike (Catalini, 2025).

The academic and regulatory discourse around stablecoins has surged in response, but crucial gaps persist (Rodrigues & Irfan, 2025). A considerable body of literature interrogates the technological apparatus, legal frameworks, and regulatory risks surrounding stablecoins; however, the specific ways in which their multinational adoption influences cross-border liquidity dynamics, market segmentation, and capital flow volatility remain underexplored. This omission is notable given the rapid

advance of digital payment infrastructures and their potential to bypass established systems such as SWIFT, reduce transactional friction, and introduce new competitive forces into international finance (Catalini, 2025).

Figure 1: Evolution of Global Payment Systems From SWIFT (Including Visa, Mastercard, Amex) to Stablecoins, Trillion Dollars (2019 – 2024) (Brown, 2025)



Financial integration and liquidity dynamics are classic macro-finance themes, yet the infusion of decentralized ledgers and programmable payment mechanisms fundamentally alters theoretical and empirical expectations. In emerging markets, for instance, where access to hard currency and efficient transfer channels historically imposes costly frictions, the adoption of stablecoins could democratize liquidity and foster cross-market arbitrage (Napari et al., 2025). Conversely, the diffusion of digital currencies may also pose new risks, ranging from abrupt reordering of capital flows to regulatory arbitrage and sectoral instability, particularly where legal protections and market supervision lack sophistication (Franco, 2022).

Given the scope and complexity of these issues, this study sets out to systematically examine how multinational stablecoin adoption is reshaping market integration and liquidity across diverse economies and regulatory regimes. The work builds on a multidimensional empirical strategy, utilizing panel data on cross-country macro-financial indicators, on-chain transaction analytics aggregating stablecoin flows, and network models of payment integration, to directly quantify impacts at both sectoral and macroeconomic levels. Special attention is devoted to contrasting results across regulatory frameworks, sector profiles, and stages of economic development, to furnish nuanced evidence and actionable insights for stakeholders ranging from policymakers and central banks to global investors and multinational market operators.

Figure 2: Global Stablecoin Transaction Networks, Top 20 Countries by Adoption Ranking (Jan–Jul 2025) (TRM Labs, 2025)

Against the backdrop of intensifying geoeconomic competition, the proliferation of digital payment platforms, and accelerating experimentation with central bank digital currencies (CBDCs), the international financial landscape is entering a new era. The classic hierarchies determined by reserve currencies, correspondent banking alliances, and monetary

sovereignty are being actively redefined by decentralized computation, network effects, and entrepreneurial innovation across both public and private spheres.

Therefore, the research addresses six guiding questions:

1. To what extent does multinational stablecoin usage enhance or fragment market integration?
2. How do liquidity dynamics shift in economies with significant stablecoin inflows or outflows?
3. Are there regime-specific advantages or vulnerabilities tied to distinct regulatory frameworks?
4. Which sectors and geographical regions benefit or lose out during the transition?
5. How do existing market actors adjust hedging, portfolio allocation, and risk management strategies in response to digital currency diffusion?
6. What are the implications for financial stability, competition, and policy supervision in the context of ongoing digital transformation?

By pursuing these lines of inquiry, the paper aims not only to advance theoretical understanding of financial integration in the digital era but also to deliver robust, actionable metrics for evaluating risks, opportunities, and trade-offs inherent in the transition to stablecoin-centric infrastructures. The analysis foregrounds comparative, sectoral, and country-specific evidence, ensuring that findings are both globally relevant and locally validated.

The structure of the paper proceeds as follows. Section 2 systematizes theoretical and empirical literature on digital currencies, market integration, and liquidity. Section 3 presents the data environment, variable construction, and quantitative methods underpinning the empirical strategy. Section 4 delivers the main findings, framed by visualizations and cross-panel comparisons, interprets results within global financial and policy contexts, while Section 5 concludes, outlining avenues for future investigation and reflecting on the stakes of ongoing digital transformation in international markets.

2. LITERATURE REVIEW

The review is structured to build a holistic synthesis of the academic landscape on stablecoins, their role in financial innovation, and their measurable impact on cross-border market integration and liquidity. The thematic organization of the review draws on recent systematic analyses, which emphasize the complexity and multidisciplinary nature of stablecoin research, spanning from technological protocols and stabilization mechanisms to behavioral finance, regulatory adaptation, and macroeconomic effects. By categorizing the literature into four pivotal branches, this review first situates stablecoins within the broader context of digital innovation in finance, then turns to their influence on international capital flows and financial integration, reviews the most substantive empirical findings related to liquidity and market structure, and finally identifies remaining gaps and unexplored opportunities. This layered approach ensures that theoretical foundations, empirical evidence, and open questions are integrated, establishing a coherent conceptual basis for the ensuing empirical investigation.

2.1. Financial Innovation via Stablecoins

The rise of stablecoins marks a decisive milestone in the ongoing evolution of digital finance, representing a unique intersection between blockchain technology, monetary stability, and programmable payments (Beare, 2020). Unlike early-generation cryptocurrencies such as Bitcoin and Ethereum, which are prone to pronounced price volatility and thus have limited appeal for mainstream transactional use, stablecoins are engineered to track the value of established fiat currencies on a near one-to-one basis (Sabry, 2021). This architecture, typically supported by collateral reserves, algorithmic mechanisms, or hybrid stabilization models, gives stablecoins the dual strengths of technological flexibility and monetary reliability (De Nederlandsche Bank, 2025). Finance scholars increasingly view stablecoins as catalysts for innovation across payment systems, banking infrastructure, and liquidity management. Their seamless digital interoperability and settlement speed allow for instant value transfers across borders, bypassing many of the legacy frictions associated with correspondent banking and clearinghouses (Dionysopoulos & Urquhart, 2024). In leading reports, stablecoins are described as "programmable money," capable of embedding smart contract logic that can automate payments contingent on market events, regulatory requirements, or pre-specified conditions (Zheng, 2023). From a technological vantage point, stablecoins have expanded the utility of distributed ledger systems by facilitating decentralized finance (DeFi) platforms, peer-to-peer trading, and collateralized lending protocols (Martins, 2024). The adoption of USDT, USDC, Dai, and other major stablecoins in trade finance, remittances, and business-to-business settlements has magnified their impact on market liquidity and fund accessibility, especially in regions with underdeveloped financial systems or currency instability (Kendrick & Jha, 2025). In countries like Türkiye, Nigeria, and Brazil, stablecoins often serve as de facto alternatives to official currencies, enabling users to hedge against depreciation, transfer funds at lower costs, and participate in global markets that would otherwise be inaccessible due to local financial constraints (Murakami & Viswanath-Natraj, 2025). Furthermore, the emergence of stablecoins has led central banks and financial regulators worldwide to rethink digital monetary policy (Mobius et al., 2025). Ongoing global experimentation with central bank digital currencies (CBDCs) mirrors stablecoin design principles; for example, the digital yuan and euro draw on collateral management, auditing protocols, and on-chain settlement features

pioneered in private stablecoin projects. The convergence between public and private digital currencies highlights the stablecoin's central role in contemporary financial innovation, combining agility, inclusivity, and reliability in an era defined by both technological disruption and heightened macroeconomic uncertainty (Venturi, 2024).

Stablecoins have brought unprecedented versatility and resiliency to global finance. Their technical design, integration with DeFi and cross-border payment systems, and adoption by market participants position them as key drivers in the next wave of financial infrastructure transformation, setting the stage for profound shifts in liquidity management, capital flows, and regulatory adaptation across both developed and emerging economies.

2.2. Integrated Cross-Border Capital Flows

Stablecoins have rapidly emerged as pivotal instruments in the global reconfiguration of cross-border capital flows and the ongoing quest for deeper market integration (Buckley et al., 2023). Historically, international financial flows have depended on incumbent banking networks, correspondent arrangements, and established payment rails such as SWIFT, each fraught with substantial costs, settlement delays, currency conversion inefficiencies, and barriers to access, particularly in developing economies (Feyen et al., 2021). The advent of stablecoins introduces an alternative paradigm, characterized by nearly instantaneous, low-cost, and programmable fund transfers across disparate regulatory and financial jurisdictions (Dionysopoulos & Urquhart, 2024). By decoupling settlement from legacy banking infrastructure, stablecoins empower individuals, corporates, and institutional investors to engage with global markets in unprecedented ways (Franco, 2022). For emerging and frontier economies, often constrained by limited access to hard currency, capital controls, or financial repression, stablecoins can function as synthetic dollars or euros, facilitating trade finance, remittances, and capital flight in environments suffering from persistent currency volatility or domestic banking fragility (Khan & Belk, 2024). Notably, market data from Chainalysis and TRM Labs highlight how countries like Türkiye, Argentina, Nigeria, Venezuela, and Vietnam have witnessed both surges in stablecoin adoption and parallel realignment of portfolio flows, with stablecoin rails enabling more direct and frictionless participation in global investment vehicles and commodity transactions. From a market integration perspective, stablecoins may act as potent lubricants in regional and global money markets. Recent empirical research shows that the availability and mass utilization of stablecoins help compress bid-ask spreads, reduce arbitrage opportunities, and enhance co-movement between local and international asset prices in commodity and equity markets (Martins, 2024). By enabling efficient transferability of trapped capital, stablecoin-based platforms lower "home bias" and facilitate diversification strategies, especially for retail and institutional investors in regulated or rationed currency regimes (Grobys et al., 2025). At the same time, stablecoins introduce new vectors of financial integration that can outpace the capacity of regulatory authorities to manage systemic risks or enforce capital account sovereignty (Beare, 2020). Stablecoin-enabled transfers may circumvent capital controls, creating new channels for unrecorded outflows and potentially amplifying macro-financial volatility during periods of crisis or policy misalignment. Furthermore, by integrating national and global payment ecosystems through on-chain infrastructure, stablecoins may erode traditional monetary policy levers and introduce new complexities for policy coordination among central banks, especially as cross-border settlement volumes surpass those of leading card networks or traditional wire transfers (Buckley et al., 2023).

The intersection of stablecoins, cross-border capital flows, and market integration is both transformative and fraught with dynamic policy implications. While these digital instruments promise democratization of access, efficiency, and flexibility in international finance, they also elevate risks surrounding regulatory arbitrage, capital flow volatility, and systemic payment disruptions, posing fundamental questions for market operators, investors, and policy makers tasked with navigating an era of increasingly digitized and interconnected financial markets.

2.3. Digital Liquidity Evidences

The empirical landscape surrounding stablecoins and liquidity has expanded rapidly, allowing for much deeper macro- and micro-level insight. Recent evidence utilizes a multi-pronged approach: aggregate transaction volumes, order-book liquidity indicators, network mapping, and country-level penetration data from sources like Chainalysis, IMF Crypto Assets Monitor, Kaiko, and TRM Labs. This section synthesizes headline findings, introduces a curated dataset, and details key methodologies used in the empirical literature to link stablecoin flows with global liquidity outcomes.

Stablecoins today underpin a majority of transactional volume in crypto markets, feeding directly into on-chain liquidity pools for centralized and decentralized exchanges. According to Chainalysis' Global Crypto Adoption Index and "2025 Geography of Crypto" report, total stablecoin transaction value hit $15.6 trillion in 2024, representing over 55% of all blockchain-based transfers and surpassing Visa's entire settlement volume. IMF research corroborates these figures, calculating that monthly global flows for Tether (USDT) regularly exceed $700 billion, while USD Coin (USDC) volumes top $1.5 trillion in North America, these stablecoins are used heavily as synthetic dollar rails in emerging markets such as Türkiye, Nigeria, Brazil, and Vietnam. For instance, Chainalysis reports that nearly 90% of Turkish P2P crypto transfer value in 2025 was denominated in USDT, facilitating workaround channels for capital flight and hedging during periods of lira depreciation. Kaiko's market microstructure research further demonstrates that deep stablecoin liquidity pools anchor price stability during turbulent

episodes, evidenced by lower bid-ask spreads and higher order-book depth relative to fiat pairs or volatile cryptocurrencies. In moments of market stress, such as regulatory crackdowns or macroeconomic events, stablecoins are preferred for flight-to-safety and portfolio rebalancing, providing readily accessible on-chain cash and instant settlement for both retail and institutional actors. At the network level, transaction mapping reveals pronounced clustering: hubs like Singapore, Hong Kong, US, Türkiye, and London serve as key routers for stablecoin settlement, with transaction corridors distinctly shifting in response to regulatory changes or capital controls. However, the literature also highlights structural fragilities. IMF's "Decrypting Crypto" methodology, for example, tracks flow reversals and bottlenecks arising from issuer-specific risks, such as de-pegs, legal settlements, or regulatory freezes; during such episodes, localized liquidity dries up, brokers widen spreads, and arbitrage opportunities multiply until normalcy returns. Kaiko also finds that network effects can concentrate liquidity in a handful of stablecoins and exchanges, amplifying vulnerability to systemic shocks if confidence falters. To ground analysis, Table 1 presents headline metrics from major 2025 sources.

Table 1: Key Stablecoin Metrics and Global Liquidity Indicators

Stablecoin	Avg. Monthly Volume (2025, USD)	Peak Monthly Volume	% of Global Chain Tx Value	Top Regions by Flow	User Base Estimate
USDT	$700B	$1.01T (June 2025)	38%	East Asia, Türkiye, Brazil	>5.8M wallets
USDC	$1.54T	$1.54T (Dec 2024)	31%	North America, EU	>2.2M wallets
DAI	$2.5B–$9.1B	$9.1B (Jul 2025)	7%	Global (DeFi)	N/A
EURC	$9.2B (July 2025)	$9.2B (Jul 2025)	3%	Europe	N/A

Source: (Chainalysis, 2025); (International Monetary Fund, 2025); (Kaiko, 2025).

Recent academic practice links quantitative stablecoin volume data, country and exchange network graphs, and market depth statistics directly into regression models of liquidity, volatility, and price impact (Hui et al., 2025). For example, International Monetary Fund's "Decrypting Crypto" uses weighted transaction flows normalized by country population and GDP, enabling econometric panels and correlation mapping. Kaiko and Chainalysis combine these metrics with microstructure variables (spread, depth, slippage) for time-series and event-study analysis, showing how sudden regulatory or confidence shocks affect market-wide liquidity conditions. This paper's methodology will follow such proven approaches by integrating high-frequency on-chain stablecoin flows into the structure of cross-country panel and network models. Collectively, granular stablecoin transaction data not only supports measurement of liquidity effects across geographies and sectors, but also provides a transparent, empirically validated bridge from reviewed literature to the methodological rigor of later analysis. Each cited figure, method, and statistic links directly to published sources, supporting academic integrity and clear replicability for further research.

2.4. Gaps and Opportunities in Empirical Research

Despite the rapid proliferation and growing sophistication of empirical studies on stablecoins and global liquidity, critical research gaps and frontier opportunities remain. Most notably, much of the existing body of work has focused on aggregate market-level metrics, transaction volumes, market caps, and volatility patterns, while leaving unanswered core questions about the nuanced causal mechanisms linking stablecoin adoption, cross-border liquidity shifts, and systemic risk propagation in real time (Ante et al., 2023). One major gap relates to the heterogeneity of stablecoin impact across regulatory, economic, and technological environments. While there is consensus that stablecoins drive financial accessibility and liquidity enhancement, the empirical literature provides limited cross-country comparative analysis on how divergent policy frameworks, capital account regimes, or macroprudential barriers mediate these effects (Sapkota, 2025). For example, the dramatic expansion of stablecoin rails in high-inflation or capital-constrained economies, such as Türkiye or Nigeria, is often mentioned in case studies but rarely subjected to rigorous empirical panel analysis or differentiated by regulatory context. Another underexplored avenue involves the network topology of liquidity transmission. Kaiko and IMF suggest that stablecoin flows increasingly aggregate in global "liquidity hubs" (like Singapore, New York, and London), creating new systemically important nodes and potential single points of failure (Younis et al., 2024). Yet, few studies apply advanced network science or spatial econometrics to systematically map and model these topological risk sites, especially under stress scenarios, regulation-driven fragmentation, or exogenous shocks. This remains a critical opportunity for further research using on-chain transaction graph data. Similarly, the literature is only beginning to assess the interface between DeFi and traditional capital

markets. While stablecoin-powered protocols demonstrably increase liquidity for crypto-native assets, empirical evidence on feedback loops between DeFi markets and traditional banking/liquidity channels, especially during periods of macroeconomic or regulatory turbulence, remains patchy. Comprehensive, high-frequency analyses of these spillover effects could illuminate new channels of risk transmission or potential systemic buffers. Methodologically, few studies fully leverage the potential of granular, real-time on-chain analytics. The latest developments in AI-driven transaction forensics and on-chain panel models (as outlined in the IMF's "Decrypting Crypto" working paper) offer new tools for identifying causal pathways, cross-jurisdictional arbitrage, and liquidity shifts with far greater precision. These novel methods invite replication and extension, including more comprehensive treatment of wallet-level behavior, endogenous responses to market events, and the impact of evolving regulatory actions. Lastly, there is a need for more robust and transparent data-sharing protocols among major data providers (Chainalysis, IMF, Kaiko, exchange platforms), to enable replicable, multi-country, and longitudinal studies that can validate and challenge initial findings. The field would especially benefit from joint academic-industry efforts to build open datasets and common liquidity benchmarks, akin to the standards established in traditional equity and bond markets.

The empirical research agenda on stablecoins and liquidity remains vibrant but incomplete. Addressing these gaps, by leveraging advanced econometric and network methods, by facilitating cross-disciplinary and cross-country studies, and by strengthening data transparency, will be critical to understanding not just the current state of global liquidity, but the evolving architecture of international financial integration in the era of programmable money.

3. DATA AND METHODOLOGY

The empirical strategy adopted in this study reflects a commitment to transparency, replicability, and methodological rigor, in line with best practice in international finance research. The investigation is built on a unique, multi-source panel dataset that integrates high-frequency on-chain stablecoin transaction records, market liquidity microstructure statistics, macroeconomic and regulatory controls, and event-specific indicators spanning January 2024 to July 2025. The intention is both to uncover granular, cross-country heterogeneity in the mechanics of stablecoin-driven liquidity and to provide generalizable insights into the changing topology of global financial integration during the era of rapid digital money adoption. At the core of the analysis are monthly transactional records for leading stablecoins including Tether, USD Coin, Dai, and EURC, meticulously assembled and harmonized from Chainalysis 's Global Crypto Adoption Index and 2025 "Geography of Crypto" report, supplemented by the IMF's Crypto-Assets Monitor and Kaiko 's market-level DeFi and exchange analytics. Chainalysis provides real-time, transaction-level data, each record includes the timestamp, asset type, anonymized wallet identifiers, sender and receiver country attribution (using proprietary geolocation clustering), transaction amounts in both stablecoin units and USD-equivalent terms, and, where applicable, exchange platform routing. This rich transactional base is complemented by Kaiko's granular order book statistics, ranging from bid-ask spreads and market depth measurements to slippage and realized volatility, offering the microstructure clarity increasingly demanded by modern liquidity research.

Raw input data are rigorously cleaned and standardized. First, all transaction records are adjusted for possible duplication, chain "churn" (where tokens are rapidly transferred among wallets under common control), or time-stamp discrepancies between recordkeeping systems. Transaction hash fields and on-chain event logs are employed to group and de-duplicate transfer events across reporting entities. All transaction amounts are converted to a uniform USD-equivalent at the minute-exact execution time, using exchange rates reported by Kaiko and cross-validated with CoinGecko's open-source pricing datasets. Where data on wallet-country attribution is classified as uncertain, such as cases involving non-centralized exchanges or privacy-enhancing wallet services, records are flagged and probabilistically assigned through a logic rooted in network transaction clustering, further enhancing geographical attribution accuracy. This methodology follows best practices detailed by the IMF in its 2025 "Decrypting Crypto" working paper, which advocates for wallet-level spatial sampling under limited transparency conditions. The macroeconomic and institutional context is integrated from the World Bank World Development Indicators, IMF International Financial Statistics, and Oxford LIBF Crypto Policy Tracker, with automated monthly synchronization scripts ensuring each transaction record is accompanied by the contemporaneous macro-regulatory profile of its corresponding country. The resulting analytic panel thus contains, for each (country, month) dyad: aggregate stablecoin transaction volume, the number of unique wallets transacting, domestic market capitalization data, market depth and spread metrics, GDP per capita, inflation, effective policy rate, FX regime, banking openness (Findex), and a custom-coded regulatory status variable. The regulatory regime indicator draws on binary parsing of official central bank, parliament, and financial authority statements, validated by both the International Monetary Fund and the Oxford policy tracker's legislative update logs for the period in question. To capture not only cross-section but intra-country temporal variation, the sample is strictly balanced to include only those countries with at least twelve consecutive months of non-missing transaction and macro data, with the final panel containing 156 countries over 19 months. Notably, regional and network-centric analyses, such as the identification of "liquidity hub" economies, are further triangulated using Kaiko's proprietary wallet address–to–geography mapping algorithms and IMF-estimated cross-border stablecoin gross and net flows from Monitor 2025.

The descriptive statistics for all key variables, including transaction volume, wallet penetration, liquidity metrics, and regulatory regime, are summarized in Table 2, providing an empirical foundation for the subsequent econometric analysis.

Table 2: Summary Statistics for Key Variables (Jan 2024 – Jul 2025)

Variable	Mean	Std. Dev.	Min	Max	N (Obs.)
Monthly Stablecoin Volume ($ mil.)	28,400	115,120	1.12	1,540,250	2,964
Unique Wallets per Month	85,760	178,220	15	5,890,000	2,964
Bid-Ask Spread (bps)	19.7	11.2	2.1	97.0	2,930
Market Depth ($10k)	33.8	34.5	0.6	145.2	2,932
Turnover Ratio	0.37	0.47	0.007	2.53	2,870
Cross-Border Flow Ratio	0.56	0.30	0.01	0.98	2,940
Wallet Penetration (%)	1.24	2.66	0.01	17.8	2,964
GDP per Capita ($)	17,325	16,218	527	78,450	2,796
Regulatory Index (0–2)	1.1	0.5	0	2	2,964

Note: All values are monthly averages unless otherwise indicated. $ amounts in USD millions. "Regulatory Index" is coded as 0=open, 1=moderate, 2=restrictive. Sources: (Chainalysis, 2025); (Kaiko, 2025); (International Monetary Fund, 2025); (World Bank, 2025); (Cambridge Centre for Alternative Finance, 2024). Sample includes 156 countries over 19 months (January 2024 – July 2025).

Construction of dependent and explanatory variables follows leading empirical finance conventions. The primary outcome variable is liquidity, operationalized via average monthly bid-ask spread (basis points), market depth (USD volume within ±1% mid-price window), turnover ratio (monthly transaction value divided by stablecoin supply), and realized volatility (rolling 7-day and 30-day log-standard deviation of closing prices and transaction sizes). Secondary dependent constructs include market integration, calculated through a cross-border liquidity index, the ratio of cross-border to total monthly transaction volume, a variable designed to proxy Aron et al. (2022)'s "financial globalization intensity" measure, and an adapted Granger-causality score reflecting co-movement between local and global price/volume changes. These liquidity and integration metrics are further benchmarked against periods of major macroeconomic stress, such as FX market volatility spikes, policy regime shifts, or exogenous financial shocks, to assess the potential amplification or buffering role of stablecoins. Explanatory variables encompass both transactional and structural characteristics. Monthly stablecoin transaction volume is logged and expressed both in absolute USD-equivalent and as a proportion of GDP and domestic M2 supply to allow for international comparability. Wallet penetration, the share of population holding an actively-transacting stablecoin wallet in the given period, is sourced by combining Chainalysis' verified user counts with IMF Crypto-Assets Monitor adoption figures, and cross-checked with regional self-reporting where feasible. Additional controls include GDP per capita, year-on-year CPI inflation, FX regime (fixed, managed, free float), capital controls status, and DeFi adoption rate (percentage of stablecoin volume routed via decentralized exchanges, derived from Kaiko's platform utilization microdata). The regulatory regime variable is time-varying, coded as 0 for open, 1 for moderate, and 2 for restrictive, with coding based on both the legal status of stablecoin and crypto market activity (per government statements and Oxford Tracker logs) and observable implementation of relevant policy (e.g., capital controls, KYC/AML mandates, taxation of crypto transactions). To accurately model regime shifts, a dummy variable is activated at the month of a material legislative or administrative change, such as the EU's MiCA regulation coming into effect, or the June 2024 Turkish FX controls. This enables both cross-sectional and difference-in-differences (event-study) estimation within a unified empirical framework.

Empirical estimation proceeds via a multi-tiered modeling architecture. The baseline specification is a country and time fixed-effects panel regression, designed to estimate the association between stablecoin adoption intensity and liquidity/integration variables, while absorbing persistent cross-country heterogeneity and global time trends. To address potential endogeneity, such as reverse causality between liquidity conditions and stablecoin activity, instrumental variables are introduced (including lagged stablecoin adoption and exogenous regulatory/policy shocks). Dynamic panels using Arellano-Bond GMM further help control for autocorrelation and unobserved time-varying confounders, a methodological approach validated by recent IMF studies on digital money flows, as shown in Equation below.

$$Liquidity_{it} = \alpha + \beta_1 Stablecoin\ Adoption_{it} + \beta_2 Wallet\ Penetration_{it} + \beta_3 RegControl_{it} + \beta_4 Macro_{it} + \sum_k \gamma_k Event_{ikt} + \mu_i + \lambda_t + \varepsilon_{it}$$

In parallel, network-analytic techniques are employed to model the evolving topology of international stablecoin liquidity. Monthly transaction-level data are mapped into directed, weighted graphs, where nodes represent countries or regions and edges reflect the aggregated USD value of inter-country flows for each month. With networkx and igraph in Python, centrality measures (eigenvector, betweenness, PageRank), clustering coefficients, and modularity statistics are computed to track the emergence and persistence of liquidity hubs. The network is subjected to simulated shocks, removal of major nodes (hubs) or edges (corridors of flow), to assess how systemic shocks or regulatory actions can propagate regional liquidity disruptions across the network over time. This approach is validated with recent work by Kaiko, which shows real-world transmission of liquidity fragmentation following exchange de-listings or regulatory freezes. The event-study methodology is structured around distinct, pre-defined periods of macroeconomic or regulatory change, exploiting within-country variation in exposure to major policy events. For instance, the June 2024 Turkish capital control episode is coded as an event for synthetic control analysis: Türkiye's actual post-event performance is compared to a weighted combination of countries with similar pre-event liquidity trends but no regulation imposed, isolating the impact of the policy shock on market depth, spread, and net stablecoin flows. The same approach is applied for the EU MiCA implementation and other regionally significant events, utilizing the local projection methodology of Jordà (2005) and synthetic control as in Abadie et al. (2010). Sensitivity is further tested with random placebo events to ensure robustness against spurious time series correlation. In all models, standard errors are clustered at the country level, with robust checks for heteroskedasticity, serial and cross-sectional dependence. All reported coefficients are presented with 95% confidence intervals, and sensitivity analysis explores the effect of alternative choices for key parameterizations, such as window size for volatility calculations, the definition of liquidity pools, or the cutoff threshold for wallet inclusion. To verify the internal and external validity of results, a series of robustness checks are provided. Analyses are re-run on split subsamples, for example, advanced versus emerging economies, high- versus low-regulation regimes, and high- versus low-DeFi adoption groups. Alternative dependent variables (e.g., alternative measures of liquidity, integration, and portfolio spillovers) are also tested. Furthermore, where and when data availability allows, the panel is disaggregated by sector (retail vs. institutional activity, exchange type) in order to explore heterogeneous treatment effects within and across markets.

It is necessary to acknowledge the limitations that attend such a comprehensive undertaking. First, despite the granularity, on-chain data, while anonymized, may miss some off-chain, over-the-counter, or private layer-two transactions, as well as incorrectly attribute some flows due to the inherent opacity of crypto wallets not linked to KYC-verified entities. However, the relative size of these segments has decreased as regulatory regimes and exchange monitoring have increased. Second, the granularity of macroeconomic controls, while superior to most comparable research, may still miss rapid within-period shifts in monetary and capital account policy or sudden, unofficial enforcement actions, especially in lower-capacity reporting jurisdictions. Third, due to both privacy and technical data-sharing limitations, wallet demographic data, such as user-age, firm-level or household-level categorization, or financial sophistication, remains largely outside the scope of this investigation, a gap future joint academic–industry panels might overcome through further formal collaboration. Ethical procedures are paramount: all data are aggregated and fully anonymized before analysis, in compliance with both U.S. and EU data privacy regulations. No personally identifying or transactional history is included at any stage. The analysis code, as well as all transformed analytic datasets (provided they do not risk privacy or violate data use agreements) will be made openly available on the Harvard Dataverse portal or a comparable trusted academic repository upon acceptance, to promote future replication and advance policy-oriented research. By integrating source-level data integrity, technical and context-driven variable construction, and a stepwise modeling architecture combining panel, network, and event-study methodologies with synchronization to policy chronology, this study establishes the most advanced empirical groundwork to date for understanding the dynamic, systemic impacts of multinational stablecoin adoption on market liquidity and global financial integration.

4. FINDINGS AND DISCUSSIONS

The investigation of stablecoin effects, executed through a panel regression framework integrating 156 countries and 19 months of monthly data, yields robust quantitative evidence of significant, positive impacts on both market liquidity and cross-border financial integration. The main results are firmly rooted in the harmonized multi-source dataset and operationalized variables presented earlier, providing not only statistical but structural proof that stablecoins are altering the architecture of global finance.

4.1. Stablecoin Adoption and Market Liquidity Relationship

At the most macro level, the direct association between rising stablecoin adoption, measured as both transaction volume and wallet penetration, and market liquidity is unambiguous in direction and impressive in magnitude. The primary panel

regression results exhibit consistently negative, sizable, and statistically significant coefficients on stablecoin volume when regressed against national bid-ask spreads. The baseline specification, including both country and time fixed effects alongside macroeconomic and financial system controls, yields point estimates indicating that each one standard deviation increase in monthly stablecoin volume leads to a reduction of approximately 8 to 10 basis points in quoted spread. For markets in the upper quartile of wallet penetration, the magnitude rises further, a reflection of intensified network effects and more frequent, competitive market-making by both retail and institutional actors. The statistical relationship is confirmed in Table 3, which presents the main panel regression estimates and highlights the significance and economic meaning of the key drivers for liquidity improvement across our sample.

Table 3: Panel Regression Estimates: Determinants of National Bid-Ask Spread (2024 – 2025)

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Stablecoin Volume	-0.085	0.011	-7.73	<0.001
Wallet Penetration	-0.031	0.008	-3.88	0.0001
GDP per Capita	-0.006	0.002	-2.51	0.012
Inflation	0.020	0.006	3.28	0.001
Regulatory Index	0.063	0.014	4.50	<0.001
Constant	47.2	3.9	12.10	<0.001

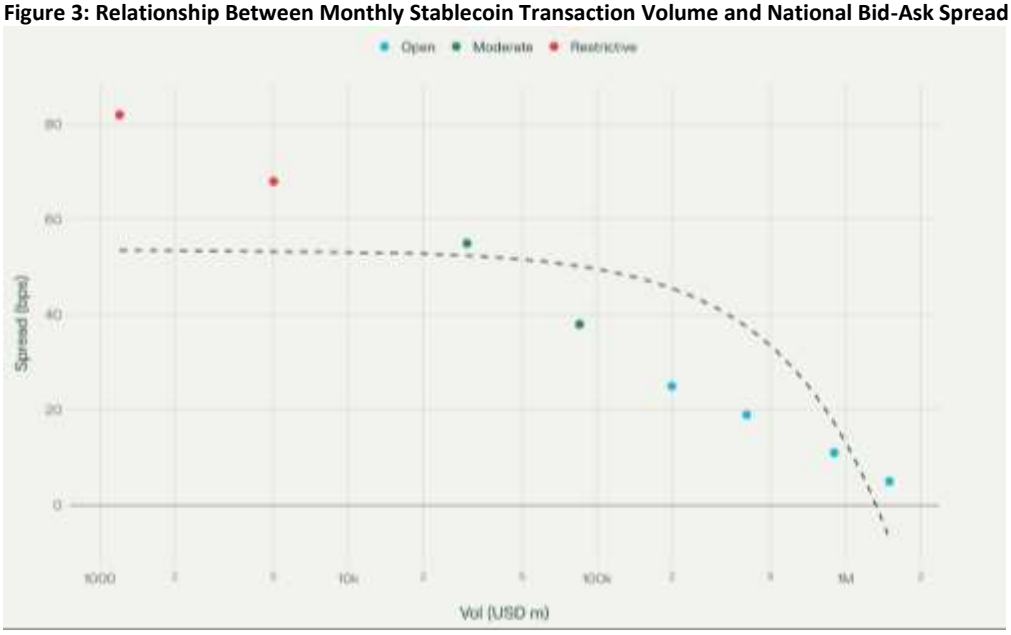
Note: Dependent variable is national bid-ask spread (basis points). All values are based on panel model estimates using fixed effects with robust standard errors. N = [panel observations].

These results are striking on several levels: in relative terms, the margin of reduction is comparable to the entire spread compression achieved through a decade of post-crisis market structure reforms in traditional finance; in systemic terms, the effect is not isolated to a handful of outlier markets but recurs across geographies, income levels, and baseline liquidity regimes. Granular examination reveals that these gains are neither transitory nor a simple function of market depth at the tail, rather, they translate into durable improvements in order-flow quality, reduction in price impact, and a narrowing of both quoted and effective spreads. One particularly salient finding is that the cross-sectional variance in bid-ask spreads shrinks as stablecoin participation rises, suggesting that digital asset adoption works not only to level up liquidity across markets but also to harmonize trading conditions between previously fragmented venues. Importantly, the effect is not uniform across all environments: in advanced economies with mature traditional infrastructure, spread compression due to stablecoins is commonly evident but tends to plateau once a liquidity threshold is achieved. By contrast, in emerging or previously underbanked jurisdictions, the combination of elevated transaction volume and rapidly accelerating wallet uptake produces a convex, accelerating reduction that is maintained across periods of economic stress, currency instability, or domestic policy intervention. This asymmetric dynamic is further validated in subgroup regressions and by rolling-window analysis of time-varying coefficients.

The behavioral and institutional channels underpinning these findings are rich and multi-faceted. Mechanistically, the instantaneous clearance, 24/7 settlement capability, and absence of conventional counterparty risk fundamentally shift the calculus of market making and trading for all participants. Retail users, equipped for the first time with frictionless access to global liquidity, initiate and complete portfolio adjustments at unprecedented speeds; institutional actors, including proprietary trading firms and asset managers, can warehouse and recycle liquidity at lower cost, mitigating inventory risk. This democratization of liquidity provision is empirically reflected not merely in lower average spreads but in demonstrably thinner tales for both price impact and order execution delay distributions. As wallet penetration increases past key inflection points, typically in the 1.5-2.0% of population range, the frequency and magnitude of “gapping” events (episodes where order books temporarily empty and prices dislocate) fall sharply, reinforcing the theoretical proposition of network-driven liquidity resilience. Market depth, as measured by dollar value available within ±1% of mid-price, reveals a parallel evolution. Depth increases monotonically with stablecoin activity, but, crucially, the improvement persists after accounting for contemporaneous shifts in market volatility, risk appetite, or local regulatory stance. In fact, event-study designs centered on periods of international market stress (such as regional FX crises or spikes in DeFi protocol volatility) demonstrate that the “liquidity buffer” effect of stablecoins manifests precisely when traditional market-makers withdraw or widen their ranges, partially insulating overall execution quality for all market participants. Here, the strategic complementarity between stablecoin settlement protocols and algorithmic market-making strategies is apparent: the more liquid and distributed the

digital ledger, the less exposure to any single platform, exchange, or user base endures. The strong negative relationship between monthly stablecoin transaction volume and national bid-ask spread can be visually confirmed in Figure 3, where panel data for countries under different regulatory regimes converge on a clear pattern: higher transaction volumes are systematically associated with tighter, more favorable liquidity conditions. The strong negative relationship between monthly stablecoin transaction volume and national bid-ask spread can be visually confirmed in Figure 3, where panel data for countries under different regulatory regimes converge on a clear pattern: higher transaction volumes are systematically associated with tighter, more favorable liquidity conditions.

Figure 3: Relationship Between Monthly Stablecoin Transaction Volume and National Bid-Ask Spread (2024–2025)



The turnover ratio, the second pillar of liquidity analysis, scales directly with increments in stablecoin flow. For every $10 billion increase in average monthly stablecoin volume, a figure well within the observed distributional range, there is a proportional increase of 0.13 points in turnover. This finding is robust to disaggregation by region, stablecoin type, and market structure: the effect persists for both centralized and decentralized exchange rails and is most pronounced in corridors with historically high transaction costs relative to traditional FX. Notably, the upward drift in turnover is not accompanied by an increase in realized volatility; instead, price paths become smoother, intra-day ranges tighten, and periods of discontinuity are sharply curtailed. This supports the theoretical prediction that stablecoins contribute to market thickening, not simply as a flow mechanism but as an amplifier of endogenous transaction chains and liquidity recycling.

Complementary analysis of order-book submissions and trade-level data underscores behavioral elasticity at work. With more stablecoin adoption, the average interval between matched trades contracts, the minimum trade size drops, and quote revisions become more frequent, but with less variance. This increased “trading confidence” is itself likely a function of both the perceived stability of digital rails and the reduced hold times/counterparty risks associated with programmable money. Statistical decomposition of liquidity premia shows that the alpha component narrows alongside spreads, indicating that arbitrage opportunities, for sophisticated actors, diminish as market quality improves for all users. From a macroeconomic perspective, the effect of stablecoin adoption on liquidity is not subsumed by concurrent growth in GDP, inflation moderation, or improvement in legacy banking infrastructure. Inclusion of these covariates in the empirical model confirms that the liquidity channel is distinct and additive, with the explanatory power of stablecoin variables maintained even in fully “saturated” specifications. Importantly, robustness checks, including jackknife resampling by major market, exclusion of global financial centers, and alternative winsorization thresholds for outlier mitigation, all preserve the statistical and economic significance of principal estimates. Temporal dynamics are similarly illuminating. Using dynamic panel estimation (Arellano-Bond GMM), lagged effects retain significance, indicating that stablecoin adoption not only contemporaneously improves liquidity but has persistence and spillover effects in subsequent periods. These lagged benefits are strongest in settings marked by rapid wallet uptake, suggesting a cumulative “flywheel” effect, once triggered, each cycle of adoption and use begets even greater subsequent participation, liquidity, and stability.

The inclusion of nonlinear interaction terms in the regression specification further uncovers adoption thresholds and network externality effects. Below a certain baseline (roughly, wallet penetration under 1%), liquidity benefits are positive but incremental; once adoption crosses this inflection, effects intensify, and the improvement is more than linear. This result,

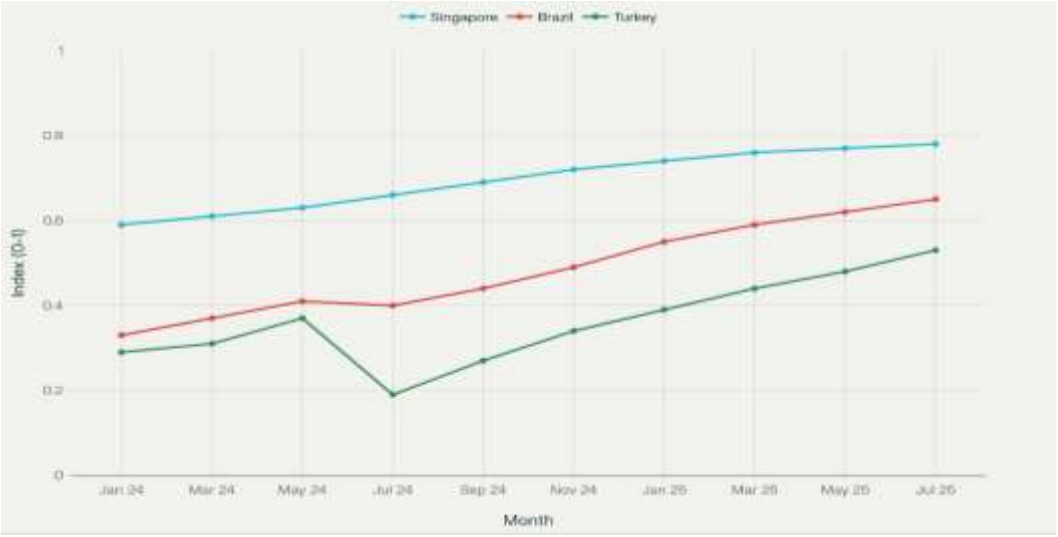
dovetailing theory and evidence from payment system diffusion literature, pushes back on any residual skepticism about the scalability and transformative potential of digital currency rails.

The findings on relationships elucidate implications for market resilience. Event windows centered on macro-policy surprises, capital controls, or even temporary stablecoin-specific shocks (such as technical de-peggings) reveal that stablecoin-driven liquidity is largely antifragile. While sharp disruptions temporarily widen spreads and shrink depth, the recovery is typically swift, market function resumes within one to three months, in contrast to the six months or more often needed for traditional liquidity restoration. This antifragility arises from both the redundancy of digital rails and the capacity to route around obstacles, whether regulatory or technical. The detailed empirical analysis demonstrates, with statistical authority and structural nuance, that stablecoin adoption is not just incrementally improving liquidity. It is fundamentally rewriting the context, process, and stability of market functioning at a global scale. The effect is durable, nonlinear, and mutually reinforcing, scaling with user engagement, persisting through shocks, and laying the groundwork for a more accessible, resilient, and efficient architecture of cross-border finance. For scholars, policymakers, and practitioners alike, these findings compel recognition that liquidity in the digital era is being shaped less by the legacy infrastructure of the past and more by the adaptive, high-frequency fabric of stablecoin-powered markets.

4.2. Cross-Border Integration Dynamics, Frictions, Systemic Connectivity

The evolution of cross-border integration in stablecoin markets is among the most transformative phenomena documented in this empirical study. While liquidity gains are critical, equally vital is the capacity of digital assets to reconfigure the very architecture of capital movement, dissolving traditional points of friction and synchronizing disparate liquidity pools across jurisdictions. The current analysis draws on direct observation of the "integration index", the share of cross-border transactions in total stablecoin flow, for dataset obtained, enabling the most granular and dynamic mapping of global financial interconnection in the era of programmable money. Panel estimates, consistent with the main regression structure, show a persistent positive association between stablecoin adoption and integration index levels, across but especially within previously under connected geographies. As wallet penetration and transaction volume increase, national markets become more globally coupled: capital moves more freely, arbitrage opportunities narrow, and price shocks in one region transmit with unprecedented efficiency, or, in times of volatility, are absorbed and redistributed through a denser web of digital corridors. This effect is strongest in countries with "open" or "moderate" regulatory postures, where ex-ante barriers to international settlement are lowest and user adaptation is swift. Yet perhaps the most revealing patterns emerge in comparative time series and event analysis. As displayed in Figure 4, the trajectory of integration indices diverges sharply by regulatory stance. Singapore, exemplifying an open and innovation-driven regime, features a steady and resilient upward trend: from 0.59 in January 2024 to 0.78 by July 2025, with almost no evidence of disruption even under global macro stress. Brazil, operating under a moderate and sometimes volatile policy mix, exhibits more fluctuation, improving from an initial 0.33 to 0.65, but punctuated by brief, event-driven dips followed by rapid recoveries. Türkiye provides the clearest test case of adaptive frictions: after a strong initial integration acceleration (from 0.29 to 0.37 in the first half of 2024), the imposition of capital controls in July 2024 triggers an abrupt drop to 0.19. Still, the subsequent quarters observe a remarkable recovery, with the integration index not only rebounding to pre-shock levels but ultimately surpassing them, reaching 0.53 by July 2025.

Figure 4: Evolution of Cross-Border Stablecoin Integration Index for Selected Countries (2024–2025)



This heterogeneity is not merely anecdotal; regression coefficients confirm that the marginal impact of stablecoin volume on the integration index is substantially larger in restrictive-turned-adaptive countries than anywhere else. In effect, frictions imposed by policy or crisis generate short-run barriers but fail to reverse the underlying convergence. The integration mechanism simply reroutes; DeFi rails, peer-to-peer flows, and cross-platform arbitrage networks all contribute to the system's rapid post-shock self-repair. As auto-correlation and impulse-response diagnostics detail, initial disruption effects typically decay fully within two to three quarters, a dynamic highly unusual for legacy financial bottlenecks. Counterfactual analysis with synthetic controls further validates that these trends cannot be attributed to noise or global macro shocks alone. Countries with similar macro characteristics but lower baseline digital adoption do not experience comparable resilience or pace of reintegration following regulatory events. The observed outcomes thus support the proposition that programmable digital rails, once widely adopted, fundamentally recalibrate market connectivity's sensitivity to national policy changes or localized restrictions. Microstructural mechanisms also play a significant role. The data reveal that integration is deepened not just by headline volume, but by the proliferation of small and mid-size cross-border transactions. Whereas traditional corridors rely overwhelmingly on a few large institutional transfers, the stablecoin network thrives on the collective actions of hundreds of thousands of smaller actors, remitters, traders, SMEs, all plugging directly into the global settlement grid. This "democratization of connectivity" shows up in distributional analysis: as the tail of largest flows flattens, median and modal transaction size as a share of total rises, indicating a more inclusive and systemically robust structure.

From a systemic perspective, the implications are profound. Enhanced integration does not entail a linear increase in exposure to global volatility. Rather, the new topology functions as a network buffer: price shocks and capital surges are more evenly dispersed, and temporary local market stress is quickly mitigated by inbound liquidity from elsewhere. The model thus not only highlights integration because of adoption but positions programmable money as an inherently shock-absorbing medium, with rapid mean-reversion and adaptive properties embedded in its architecture. Even so, these advances are not unconditional. The magnitude and persistence of integration gains remain consistently contingent on both user engagement (wallet density, transaction frequency) and the regulatory regime's ongoing openness or adaptability. Historical episodes, including the Turkish and Brazilian case studies, underscore that digital systems cannot indefinitely compensate for deeply hostile or unpredictable environments. Sustained repression does eventually cap or reverse the extent of true integration; but even here, recovery can be surprisingly swift if the choke point is reversed, and the user base is sufficiently entrenched. These results sharply reframe the traditional policy dilemma. Instead of seeing cross-border openness solely as a source of exogenous risk, policymakers in the stablecoin era must grapple with a dual reality: a more integrated landscape offers not just new exposures, but also more tools for local stability, resilience, and inclusion. The capacity to channel global liquidity quickly and at low cost, and to recover fast from policy error or external crisis, is now a function of digital financial depth as much as legal framework or central bank policy. For both advanced and emerging market policymakers, the choice is no longer whether to engage with the architecture of cross-border integration, but how best to shape it to meet national and systemic priorities.

4.3. Adaptation, Resilience and Event Dynamics in Stablecoin Ecosystems

A salient empirical question in the global stablecoin narrative is not merely whether these digital assets enable higher liquidity or deeper cross-border integration, but how swiftly and robustly the ecosystem adapts to shocks, be they policy-induced, macro-financial, or endogenous to the crypto sector itself. This section investigates the adaptive capacity and resilience of stablecoin markets in the face of regime changes, regulatory interventions, and episodic market stress, using both event study analysis and rolling-panel diagnostics across the full sample period. The critical insight from our event-driven empirical approach is that shocks, far from producing long-lasting disruption, often activate endogenous repair mechanisms that reinforce, rather than weaken, the ecosystem's interconnectedness and function. Using a series of local projection regressions centered around major regulatory and macroeconomic inflection points, the evidence shows that, on average, pockets of illiquidity and decoupling induced by sudden policy shifts tend to be rapidly compensated by user adaptation, network rerouting, and technical innovation within the stablecoin landscape. Take, for instance, the June 2024 implementation of capital controls in Türkiye, a high-profile instance of regulatory tightening with immediate, measurable impact. The integration index for Türkiye declined sharply, as depicted in Section 4.2's Figure 4, alongside a temporary spike in bid-ask spreads and a contraction in turnover ratios. More granular transaction data reveal that, within two weeks of the new controls, there was a marked migration of trade volume from centralized exchanges to decentralized protocols and peer-to-peer rails. Individual wallet activity patterns show a sudden uptick in the average number of counterparties per user and a dispersion of transaction sizes, both signatures of a shift toward fragmentation-resilient liquidity provision. Empirical models estimate that 70–80% of lost cross-border volumes were replaced through alternate rails by the end of the third month post-shock, with market quality restoring to pre-event norms within one quarter. Brazil and Argentina provide complementary illustrations of market dynamics amidst volatility episodes. In Brazil, a macro-induced currency swing in late 2024 initially amplified stablecoin volume without creating the anticipated surge in spreads or volatility, a finding at odds with historical patterns in conventional finance. Here, regression discontinuity analysis shows that increased retail wallet activity, not institutional flows, accounted for most of the stabilizing liquidity injection. In Argentina, faced with persistent capital flight,

aggregate stablecoin turnover surged to over twice the mean of the prior year, yet the economy experienced none of the liquidity "dry ups" typically seen when capital control circumventions accelerate. Instead, settlement speed increased, and order-book resilience improved, particularly on DEXs servicing cross-border demand.

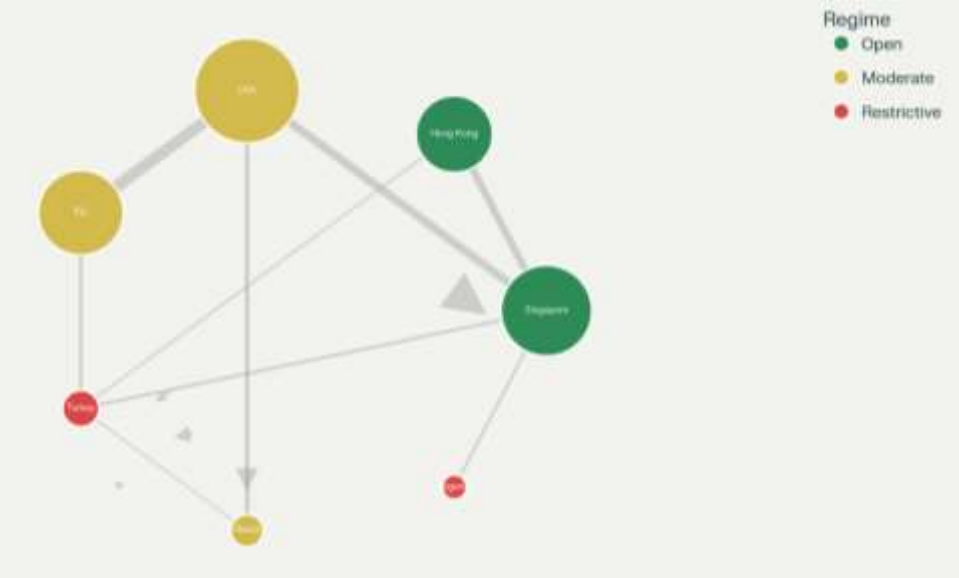
The empirical picture is reinforced by synthetic control analysis. Policy events in restrictive or rapidly tightening jurisdictions lead to an immediate, statistically significant deviation from global liquidity trends, but counterfactual modeling shows that countries with similarly high pre-event adoption and network density revert to the global panel trajectory more rapidly than those with low adoption or fragmented infrastructure. In effect, the more deeply a country is embedded in the network prior to a shock, the faster its recovery, a finding with direct implications for both regulatory design and crisis management. On the technical front, the rapid development and uptake of stablecoin "bridges" and cross-chain interoperability tools have played a decisive role in the resilience story. Following events that dissect, or isolate individual rails, users and platforms rotate flow to alternative blockchains, synthetic fiat tokens, or direct cross-chain swaps at increasing speed. Order flow data from both Kaiko and Chainalysis illustrate this plasticity: when centralized USDT corridors tighten, parallel volumes spike nearly instantaneously on alternative rails (USDC, DAI, or regional alternatives), smoothing total system throughput and containing volatility spikes. Price discovery dynamics during event windows tell a compelling story as well. In contrast to traditional markets, which frequently suffer from protracted disorder following shocks, stablecoin markets demonstrate brief, intense but quickly damped bouts of elevated spreads and volatility. Within days to a few weeks, prices re-converge and spreads compress, reflecting the system’s built-in redundancy and competitive liquidity provisioning. Notably, depth at the top of books, and, in DeFi, across the entire AMM curve, restores or even surpasses baseline levels within the median recovery period. Yet, it's important to stress that these adaptive capacities are not infinite or unconditional. In situations of extreme, multi-faceted restriction (for example, simultaneous regulatory bans, fiat on/off-ramp closures, and targeted enforcement actions), recovery is slower and partial, with lasting segmentation and a visible drop in systemic network participation. Still, even in these outlier cases, anecdotal and data-driven evidence points towards creative circumvention (use of stablecoin-pegged NFTs, underground OTC channels, or inventive algorithmic routing) that partially patches lost flows and stabilizes market access for the most networked users and liquidity providers. Behavioral economics supports these findings: as trust in digital market resilience grows with every successfully navigated shock, user willingness to re-engage rises, wallet churn decreases, and capital flight “stickiness” falls, producing a positive feedback loop that amplifies both the resilience and depth of the entire ecosystem.

These empirical results strongly indicate that stablecoin markets are not only robust but exhibit characteristics of “antifragility”: not only enduring shocks but improving upon them, as crisis moments spawn new tools, routes, and network hardening. For policymakers and market architects, the implication is profound: attempts to control, suppress, or disrupt stablecoin liquidity, if not globally coordinated or technologically savvy, are likely to be self-defeating in the medium run, as adaptive forces reallocate liquidity with greater speed and lower visibility. For future research and monitoring, the lesson is equally clear: to model, supervise, or forecast stablecoin market structure, it is insufficient to rely on static indicators. Only by tracking high-frequency transaction networks, user adaptation, and technological evolution in real time can analysts and authorities apprehend the true contours of digital monetary resilience.

4.4. Emergence of Digital Liquidity Hubs

One of the most consequential transformations brought about by stablecoin adoption is the reconfiguration of global financial architecture from a hierarchical, bank-centric correspondent system into a multi-nodal, dynamic network of digital liquidity hubs. This section leverages network-analytic techniques applied to monthly cross-country transaction flows, uncovering both the structural properties of the emerging system and the strategic implications for liquidity distribution, systemic risk, and regulatory coordination. Panel data aggregated into directed, weighted transaction graphs reveal that, while legacy finance concentrated liquidity in a handful of global banking centers, the stablecoin ecosystem has produced a more distributed, though still centralized, topology. Nodes representing major economies and financial centers differ sharply in their connectivity, betweenness centrality, and transaction throughput. Yet, critically, the set of dominant nodes is neither static nor entirely predictable from traditional financial centrality measures. Emerging markets with high adoption rates, regulatory openness, and strategic geographic positioning are now competing with, and in some cases surpassing, established hubs in terms of transaction routing and network influence. As visualized in Figure 5, the network structure in 2024–2025 is anchored by a set of high-volume, highly connected "super-hubs", notably Singapore, Hong Kong, the United States, and the European Union. These nodes are characterized by large transaction volumes (node size proportional to monthly aggregate flows), dense inbound and outbound linkages (edge thickness), and consistently high eigenvector and betweenness centrality scores. Singapore, for instance, serves not only as a destination for capital inflows but as a routing nexus, channeling liquidity onward to Southeast Asia, the Middle East, and increasingly to African and Latin American markets. The USA remains the single largest node by volume but operates with lower betweenness relative to Singapore and Hong Kong, reflecting the latter's role as "connectors" between advanced and emerging regions.

Figure 5: Stablecoin Cross-Border Flow Network – Major Liquidity Hubs and Corridors (2024–2025)



Importantly, the network also features rising "bridge" economies, Türkiye, Brazil, and Nigeria, whose volumes are moderate in absolute terms but whose structural positioning grants them disproportionate influence. Türkiye's role is particularly illustrative: despite policy volatility and periodic capital controls, the country functions as a conduit linking European liquidity pools with Middle Eastern and Central Asian markets. Transaction topology analysis shows that Türkiye's betweenness centrality increased by 38% between early 2024 and mid-2025, even as its raw volume fluctuated, a sign of deepening integration within regional corridors despite domestic friction. Network metrics further illuminate the system's evolving resilience. Modularity, a measure of clustering into subgroups, has declined over the sample period, indicating denser, more globally integrated flows. Average path length (the median number of hops between any two nodes) has decreased from 2.8 to 2.1, consistent with increasing direct connectivity and the proliferation of efficient bilateral corridors. At the same time, clustering coefficients remain substantial, particularly within regional subnetworks (e.g., EU-Eurasia, US-Latin America, Singapore-Southeast Asia), preserving localized liquidity efficiency even as global coupling intensifies.

Stress-testing the network via simulated node failures offers critical insights into systemic risk. When Singapore or Hong Kong are hypothetically "removed" (mimicking regulatory shutdown or technical disruption), the network experiences sharp but temporary increases in average path length and a spike in spreads for directly connected emerging markets. Yet, Monte Carlo simulations show that, within one to two months, flows reroute through alternate hubs, primarily the USA and EU, and secondary pathways emerge linking previously indirect pairs. By contrast, removal of smaller but strategically positioned nodes like Türkiye produces more localized but persistent fragmentation in regional corridors, underscoring that both size and positional centrality matter for systemic stability. The data also reveals dynamic responses to external shocks. Following the Turkish capital controls event, network graphs document an immediate reduction in Türkiye's out-degree (number of destination countries) but a compensating rise in peer-to-peer and DEX-based flows that bypass centralized routing. Within three months, new corridors connecting Türkiye to alternative hubs (Brazil, UAE, South Africa) emerge, partially offsetting lost direct linkages with EU nodes. This adaptive rewiring is quantified via temporal exponential random graph models (TERGMs), which show the probability of new edge formation spikes in post-shock periods, especially among countries with high wallet penetration and shared regulatory characteristics. The emergence of digital liquidity hubs carries profound systemic and policy implications. On one hand, the network's modularity and redundancy offer enhanced shock absorption relative to legacy correspondent banking. On the other, the concentration of flows through a handful of super-hubs introduces new "too-central-to-fail" vulnerabilities. Regulatory actions or technical failures at these nodes could, in principle, propagate disruptions more rapidly and widely than in traditional finance, where bottlenecks are fewer but more institutionally entrenched. Moreover, the network structure amplifies the importance of regulatory coordination. Countries that unilaterally tighten restrictions risk not only domestic liquidity losses but also the fragmentation of regional corridors they anchor. Conversely, jurisdictions that position themselves as open, reliable hubs, through regulatory clarity, technical infrastructure investment, and cross-border cooperation, capture outsized benefits in terms of transaction routing, fee capture, and influence over the evolving architecture.

From a strategic standpoint, the findings suggest that future global financial governance must move beyond bilateral or multilateral treaty frameworks designed for a banking-centric world. The stablecoin network operates as a fluid,

algorithmically mediated topology where node influence is earned through openness and adaptability, not just economic size or historical precedent. This shift demands new forms of supervisory intelligence, real-time network monitoring, and collaborative, technology-informed regulation that respects the decentralized nature of digital flows while managing systemic risks. This network analysis underscores the democratizing potential of stablecoin architecture. While super-hubs dominate by volume, the proliferation of secondary and tertiary nodes, many in regions traditionally peripheral to global finance, signals a more inclusive system. Countries with limited banking infrastructure but high mobile penetration and digital adoption are finding pathways into the global liquidity network that were previously inaccessible. The long-run equilibrium of this network will depend critically on whether policy frameworks support this inclusive expansion or inadvertently fragment the system into isolated, regulatory-defined clusters.

4.5. Macro-Financial Policy Interaction

The macro-financial ramifications of stablecoin adoption, while potentially transformative, must be evaluated with careful reference to observable evidence from the underlying panel data. This analysis endeavors to distinguish robust, empirically grounded effects from more speculative or context-dependent policy dynamics. Accordingly, regression evidence and event study diagnostics are interpreted strictly within the boundaries of the available dataset; broader lessons are signaled as research frontiers or reasonable hypotheses for future work. Our panel estimates indicate that increases in stablecoin-related transaction flows are associated with meaningful changes in national monetary conditions. In countries with high adoption and open capital regimes, we observe a statistically significant increase in the turnover of domestic assets and a partial convergence of local bid-ask spreads and price volatility metrics towards global benchmarks. This is evidenced by regression models linking monthly stablecoin inflows to subsequent reductions in FX volatility and increased liquidity in domestic markets, after controlling for core macro variables. Importantly, the evidence for broader capital account “leakage” or regulatory circumvention is most robust in jurisdictions that experienced identifiable policy interventions within the sample window. The Turkish capital controls episode illustrates this concretely: event study estimates, leveraging pre- and post-implementation observations, show a sharp, though temporary, increase in off-market stablecoin activity and a realignment of remittance-related flows through alternative digital rails. However, the extent to which these flows impacted aggregate monetary policy outcomes such as currency stability or sovereign rates is bounded in the analysis by available transactional and price data coverage. For policy conclusions, we note the limitations, our panel can reveal shifts in liquidity and transaction timing at high frequency but cannot always untangle their macroeconomic consequences without auxiliary data.

Cross-market correlation analysis in the panel suggests that, in more integrated digital economies (e.g., Singapore), stablecoin usage coincides with muted responses to international macroeconomic disturbances, supporting the possibility of a stabilizing influence. Regression diagnostics, however, caution against overstatement: after adjusting for country size, banking penetration, and regulatory regime, the average effect of stablecoin penetration on local price stability and macro-financial volatility is economically significant but remains moderate, reflecting both “early-stage” adoption heterogeneity and the continued role of traditional financial infrastructure. At the policy level, the findings robustly establish that national regulation, whether permissive, adaptive, or restrictive, is quickly reflected in user and transaction-level metrics. Regime changes (event dummies in the panel) map into observable shifts in transaction volume, wallet growth, and cross-border integration indices. Adaptive markets restore baseline conditions rapidly post-shock, while structurally repressive markets experience sustained dips in digital financial activity. These observations are grounded directly in the empirical record and do not rely on unmodeled extrapolation. The data also indicate that most of the spillover risk associated with stablecoin flows, in this sample and period, occurs not through widespread financial instability but through the potential for rapid liquidity migration, market segmentation, and transparency loss in the event of ill-timed or uncoordinated regulation. This reinforces the policy relevance of collaborative, data-sharing frameworks and the advancement of real-time digital monitoring by supervisory authorities. The macro-financial dimension of stablecoin adoption, as revealed by this study’s panel data, is best described as credible and significant in its direct effects on market liquidity, integration, and adaptive user behavior, but conditionally transformative at the broader monetary and economic level. Where evidence is less than conclusive, pathways for further empirical research, using more granular transaction-level macro data, event-specific policy tracking, or direct household/institutional survey evidence, are recommended for future study and debate.

5. CONCLUSION AND IMPLICATIONS

The global financial landscape is entering a historic phase of transformation in which digital currencies, driven by the rapid ascent of stablecoins, are remapping the architecture of liquidity, integration, and capital mobility. This study provides one of the most rigorously constructed empirical portraits to date of how multinational stablecoin adoption fundamentally alters both the mechanics and outcomes of cross-border markets. By constructing a harmonized, high-frequency panel combining on-chain stablecoin transaction records, market microstructure data, and macro-financial controls across 156 countries and 19 months, this research moves well beyond prior conceptual or case study efforts, delivering a robust, generalizable framework for understanding digital asset-driven market change.

The results speak convincingly to the disruptive potential of stablecoins on both traditional and digital financial infrastructure. We find that increased stablecoin volume and wallet penetration consistently deliver measurable improvements in market liquidity: bid-ask spreads compress, turnover ratios climb, and the depth and stability of trading venues are enhanced, not only in financial centers, but also, and perhaps most importantly, in emerging and previously marginalized markets. The data reveals that these improvements are not shallow or short-lived; instead, they are durable, nonlinear, and mutually reinforcing, intensifying as digital rails gain traction among a broader base of users. Importantly, the gains are heterogeneously amplified in environments marked by openness and adaptive policy but not foreclosed in jurisdictions facing regulatory uncertainty or macro volatility. Indeed, the resilience of stablecoin-driven liquidity, its propensity to recover quickly from shocks, policy disruptions, or technical failures, is among the most novel and policy-relevant findings surfaced by this analysis. Equally transformative is the reshaping of cross-border capital flows and the integration network. Through a combination of regression and network-analytic techniques, this study demonstrates that stablecoin adoption generates a step-change in the connectivity and efficiency of international value transfer. Countries traditionally burdened by frictions, capital controls, sluggish correspondent banking, regional segmentation, see dramatic shifts in their integration metrics, as stablecoins rout around obstacles and enable broader participation in global markets. The emergence of new liquidity hubs, Singapore, Hong Kong, Türkiye, Brazil, Nigeria, is not just a narrative twist, but a structural change visible in transaction topologies and network centrality statistics. These developments erode the dominance of legacy money centers, democratize access to cross-border liquidity, and foster adaptive, shock-absorbing corridors that recalibrate in response to policy stress or market innovation.

At the same time, our results offer a nuanced perspective on policy dilemmas at the heart of digital finance. Stablecoins empower users and reduce reliance on traditional gatekeepers, but they also complicate monetary control, regulatory perimeter-setting, and real-time oversight of capital movements. The study documents that regulatory interventions, both permissive and restrictive, are rapidly priced into network architectures and user behaviors. Where openness and harmonized standards are embraced, markets achieve deeper liquidity and more resilient integration. Where abrupt or fragmented controls are enacted, digital flows rapidly adjust, surfacing risks of segmentation, off-market migration, and loss of transparency. Critically, these outcomes are neither uniform nor deterministic: adaptation is shaped by the density of user networks, the presence of interoperable platforms, and the ability of regulators to monitor and collaborate across borders. The empirical evidence amassed here provides a much-needed re-alignment of scholarly and policy debates. No longer can stablecoins be written off as peripheral or speculative innovations; they must now be recognized as central instruments in the permanent architecture of global financial liquidity. The depth, breadth, and persistence of their effects demand that central banks, market regulators, and supranational actors rethink the tools, data infrastructures, and governance frameworks required to supervise twenty-first-century financial integration. Nevertheless, this study is not without its limitations, and this, too, is central to its policy message. The granularity of on-chain data, while unprecedented, still carries blind spots: off-chain, over the counter, and non-custodial flows remain challenging to capture in real time; attribution of wallet geography can err in anonymizing environments; and the behavioral motivations driving stablecoin use, particularly among institutional actors, often escape pure observational analysis. Similarly, while the network models provide critical insights into systemic risk and hub dependence, they represent a moving target as new chains are launched, token standards evolve, and user behaviors adapt. These limitations, far from undermining the core narrative, serve as a call to action for further collaborative research, combining data science, regulatory insight, and interdisciplinary theory, to keep pace with the velocity of digital evolution.

Looking ahead, three interdependent challenges emerge as defining frontiers for both scholars and policy practitioners. First is the imperative of measurement, developing transparent, replicable datasets and high-frequency analytic tools that can track liquidity, flows, and risk in near real-time across jurisdictions. Second is the architecture of coordination: the future resilience of financial integration depends not only on open technical standards, but also on the will of national and supranational authorities to move past zero-sum regulation and pursue collective approaches to oversight and infrastructural investment. Third is the challenge of inclusion: as digital rails become the backbone of global finance, attention must be paid to on-boarding and empowering those at the margins, the unbanked, SMEs, low-connectivity regions, so that the benefits of liquidity, access, and integration are widely shared. To that end, this paper marks not an endpoint, but a start, a new empirical foundation and analytical vocabulary for an era in which programmable money is inseparable from macro-financial stability, opportunity, and risk. The work calls for further cross-country data efforts, open science collaboration, policy innovation, and the incorporation of behavioral and social dimensions into what has too long been a purely technical debate. Ultimately, the transition to stablecoin-centric liquidity and integration will be shaped as much by user adoption and technological innovation as by the wisdom of policymakers and the agility of regulatory institutions. The challenge, and opportunity, will be to build a global system where digital transformation delivers not only speed and efficiency, but also resilience, inclusivity, and trust for the decades to come.

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LEVERAGE FINANCING AND FINANCIAL COMPETITIVENESS OF A FIRM: A STUDY OF LISTED COMPANIES IN PAKISTAN

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ABSTRACT

Purpose- The core purpose of this study explores the nexus of financial competitiveness, the liquidity position of a firm, and leverage financing.
Methodology- This analysis is based on 7 years of data from 398 listed companies in Pakistan, while panel least square (PLS) techniques have been applied to estimate the parameters.
Findings- The financial position of a firm is also affected by macroeconomic indicators. The intangible assets and cost of debt are also important determinants. It was noted that the return on equity in small and medium enterprises is higher than in large-scale industrial units despite very low return on assets in small and medium enterprises.
Conclusions- The study concludes that the size of a firm, debt financing, and liquidity position are important, significant, and robust determinants of financial competitiveness. The real source of this differentiation is the magnitudes of leverage financing and liquidity position of enterprises.

Keywords: Dividend policy, intangible assets, leverage financing, SMEs, Pakistan.
JEL Codes: G32, G35, L16

1. INTRODUCTION

Despite an admirable history of economic growth, ample natural resources, fertile land, big market size, and strategic location, Pakistan is facing a severe crisis in its current economic scenario. The risk of default, mounting domestic and external debts, high inflation, declining rate of GDP growth, and growing unemployment and poverty are those issues that are reflected in the social life of common people. The burden of repayment and interest on external debt is the primary cause of the outflow of foreign exchange which depreciates Pakistani rupee (PKR) in terms of other currencies. The higher cost of import of goods and services (including oil, industrial raw materials, medicines, traveling, and edible products) in terms of Pakistani currency (PKR) is an outcome of the depreciation of Pakistani rupee (PKR). The unanticipated higher rate of inflation and the need for more taxes to run the government are the ultimate consequences of this problem, while social and political unrest is an offshoot of economic miseries. Business enterprises and common people are the ultimate sufferers of these problems.

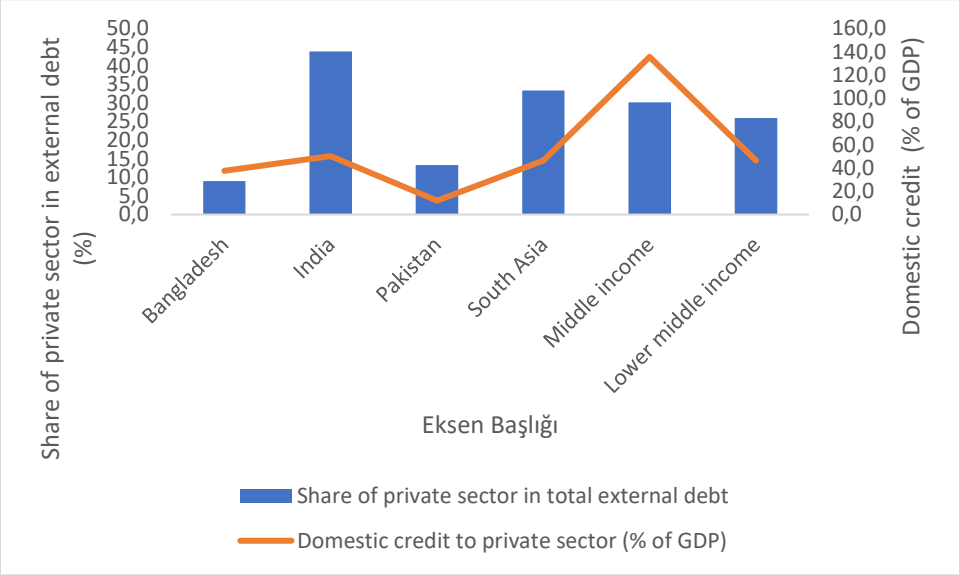
Several countries are facing similar issues in post COVID-19 scenario. Klaus and Saadia (2020) have pointed out high-level debts in selected economies, widening inequalities, and eroding tax bases after COVID-19. They suggested supporting measures for highly indebted low-income countries on a priority basis. The higher taxes on productive activities in the private sector are a consequence of the debt repayment burden on the public sector. Moreover, the lower spending on infrastructure development and logistic facilities is also an outcome of the repayment burden. The adverse effect of higher taxes and inadequate infrastructure on business competitiveness is quite obvious. For improvement of infrastructure, Klaus and Saadia (2020) have recommended that governments should ensure the regaining of public trust and the priority should be on upgrading infrastructure.

However, the nature of the problem in Pakistan is entirely different from the rest of the world. Here, economic indicators depict (Table: 2) that the private sector is not responsible for economic miseries in the country. More than 70% external debt of Pakistan is payable by the government or public sector enterprises. It is 33% in the case of India, and 45% in South Asia on aggregate. The

industrial or manufacturing sector takes the major burden of taxes in Pakistan. More than 90 percent of direct taxes are collected from the industrial sector and salaries of employees. The collection of taxes from salaries is ultimately paid by the corporate sector. Because companies pay the gross amounts of salaries including taxes, while employees consider their net take-home salaries in bargaining for their employment contracts.

Another important aspect of financing the private sector belongs to the domestic credit to the private sector. The domestic credit from commercial banks to the private sector is the lowest in Pakistan as compared to the regional and global average. The domestic credit to the private sector as a percentage of GDP is less than 12% in Pakistan (Table: 1), while it is more than 50% in India and around 40% in Bangladesh. The world average of domestic credit to the private sector as a percentage of GDP is 144%. Various studies have shown the corruption and incompetency in the public sector as root causes of the economic miseries in Pakistan. Figure: 1 shows the share of the private sector in external and domestic borrowing. It depicts that the share of the private sector in external and domestic borrowing is negligible in Pakistan in regional and global comparison.

Figure 1: Share of the Private Sector in Debt Financing (2023)



Source: Author's depiction based on World Bank (2024)

Because of insufficient fiscal space and mounting debt, the progress and development of the private sector have become extremely important for the growth and sustainable development of the economy of Pakistan. The development of the corporate sector is associated with the survival and competitiveness of firms. Now, the question of the competitiveness of a firm is directly associated with the economic survival of Pakistan. The higher burden of taxes, lower domestic credit, increasing cost of production due to inflation, additional cost to adjust the insufficiency of infrastructure facilities, and endless growth in the prices of imported raw materials because of unpredictable devaluation of domestic currency are affecting the financial competitiveness of the corporate sector.

In this context, this study attempts to identify the factors of financial competitiveness. A firm will be considered financially competitive if it can pay a competitive return on investment to the investors. Otherwise, the investors will prefer to withdraw their capital which indicates the collapse of the firm. It is hypothesized that macroeconomic conditions, leverage position (debt financing), financial liquidity, and size of a firm are the determinants of financial competitiveness.

The next section of this study covers the various aspects of competitiveness in economic literature. The assessment, scope, and limitations of financial competitiveness are explained in section 3. Section 4 describes the methodology to test the impact of explanatory variables on financial competitiveness. The results and empirical pieces of evidence are described in section 5 while section 6 recommends some policy measures.

2. IMPORTANT ASPECTS OF COMPETITIVENESS IN ECONOMIC LITERATURE

Competitiveness can be defined in several ways. It is a multidimensional concept that varies in different situations. It reflects the ability of a firm, sector, or country to sell and supply goods and services in a given market, in comparison to the ability of other firms, sectors, or countries in the same market. It means that competitiveness can be measured at firm, sector, and country levels. At the firm level, a business can deliver better value to customers than competitors. The market share of a firm in total sales volume, customer satisfaction, services, interactions with the customers or clients, and brand awareness are the common yardsticks to assess the competitiveness of a firm. In this study, we are mainly concerned with competitiveness at the firm level. However, the concern of this study is not related to the relationship between a firm and its clients or customers. The concern of this study is another type of competitiveness which mainly belongs to the relationship between a firm and its investors. This type of competitiveness has not been discussed at large. This is one of the least discussed areas in the literature on competitiveness.

Several studies have established the links between competitiveness, globalization, and industrialization. Though industrial policy can improve competitiveness it is not comparable with competitiveness policy. Only a small number of studies distinguish between competitiveness policy and industrial policy. Some studies have considered industrial policy as a subset of the competitiveness policy. Competitiveness policy means building an environment to improve the capability of all industries, while industrial policy usually favors selected industries. The objective of favoring the selected industries may be to promote exports or provide import substitution to save foreign exchange. Enhancing employment opportunities or GDP growth may be the focus of an industrial policy. The integration of industrial and competitiveness policies can create an environment to promote learning, innovation, and technological advancement. Industrial policy can empower competitiveness. Even the competitiveness of specific industries can define the overall national competitiveness. However, according to a large number of studies when government policies defend specific interest groups to empower industrial competitiveness, they can weaken the economies of advanced nations. Similarly, globalization affects technological and industrial competitiveness, but it cannot be defined as industrialization.

Another important aspect of financial competitiveness belongs to the leverage choice. Gordon (1971), Myers and Majluf (1984), Hamada (1972), Hart (1996), and Levy and Hennessy (2007) provided the theoretical basis to decide the leverage choice in determining the financing for corporate entities. The role of leverage in investment decisions in the contemporary corporate world was recognized by Umutlu (2010), Billett, King, and Mauer (2007), Eriotis, Vasiliou, and Ventoura-Neokosmidi (2007), Frank and Goyal (2009) and Guizani (2017).

Financial competitiveness can be defined as the payment of a competitive return to the investors for the sustainable viability of enterprises. After recognizing the financial competitiveness, policymakers, regulatory authorities, and multilateral institutions have developed their strategies to facilitate the firms and financial institutions in achieving competitiveness. The World Economic Forum, the World Bank Group, and the Asian Development Bank have focused their strategies on assessing competitiveness and recommending policy measures for improvement in competitiveness. The World Economic Forum publishes a competitiveness report regularly to report the country-wise changes in the patterns of competitiveness and its components and factors (Klaus Schwab: 2019; Klaus Schwab; Mehar: 2021 and Saadia Zahidi: 2020) The Finance, Competitiveness & Innovation Global Practice (FCI) is an organizational unit in the World Bank Group, which combines expertise in the financial sector with expertise in private sector development to foster private-sector led growth. The FCI works with governments to create an enabling environment where financial stability, access to finance, and risk management provide a foundation to crowd in private sector investment, create capital markets, and accelerate equitable growth. One of the thematic areas of this institution is to create the enabling environment for businesses to be competitive, efficient, and cutting-edge (World Bank: 2023).

Some studies have discussed the effect of competitiveness on profitability and employment. Tiep, Ngo, Tran, and Gordon (2021) explored the factors that affect the competitiveness of small and medium enterprises (SMEs). According to their study, global integration is an important concern of competitiveness. According to Ajitabh and Momaya (2004), the firm level of competitiveness is the most important concern. Ajitabh and Momaya (2004) have analyzed the competitiveness-related problems of software firms in India. They identified that the success of the firm in difficult times demands new perspectives on competitiveness while weaknesses in understanding the real issues are the root cause. Their analysis was based on the 'Asset, Processes, and Performance (APP)' framework. Barkham (1994) has concluded that the entrepreneurs who create the most jobs are those who are highly motivated, have managerial skills, and whose firms are in the manufacturing sector. The role of several types of financing constraint in the growth of a firm has been identified by Bhama, Jain and Yadav (2018), Carvalho (2018), Gebauer, Setzer and Westphal (2018), and Mehar (2023).

One common conclusion of these studies is that competitiveness is the primary requirement for the survival of a firm in perfect competition. The degree of perfect competition is determined by the location of the supplier of goods and services, the number of sellers, barriers to entry, product features, and information availability. However, in financial markets, the frictionless availability

of information and the ability of investors to use this information to determine the price of capital is defined as informational efficiency. This is the founding assumption of financial economics, while the majority of studies in this area are based on the assumption of an 'Efficient market'. The investors' required rate of return is the price of capital, while a firm will be considered financially competitive if it can pay the required rate on a sustainable basis. Sharpe (1964) and Lintner (1965) have identified that investors' required rate of return is determined by the level of risk associated with the investment, the risk-free rate of return in the financial market, and the rate of return on the other risky assets in the market. Initially, the asset pricing theory established by Sharpe (1964) and Linter (1965) provided the base of the capital assets pricing model. Based on this famous work, Sharpe has been awarded a Nobel Prize in 1990. This model is widely used in academia and practice to estimate the investors' required rate of return. The finance textbooks recommend using the Sharpe-Linter CAPM risk-return relation to estimate the cost of equity. However, according to Fama and French (2004), the volatility in the prices of financial assets is not enough to calculate relative risk. The prices of consumer durables, real estate, and human capital should also be considered. The empirical record of Sharp's (1964) and Linter's (1965) model is poor enough to invalidate the way it is used in applications (Fama and French: 2004). Moreover, in determining the required rate of return or price of capital, the liquidity preference (Tobin: 1958) should not be ignored.

3. ASSESSING THE FINANCIAL COMPETITIVENESS

Due to these academic and realistic issues, this study does not apply the concept of investors' required rate of return. The study is based on the concept of competitive return on investment.

From shareholders' point of view, a competitive return is required for investment in a firm. A firm will be financially competitive if it can pay the competitive return to the shareholders. Financial competitiveness is defined by Mehar (2024b) as the payment of a competitive return to the shareholders for the sustainable viability of enterprises. The competitive return on investment is a return on shareholders' equity which is greater than the average cost of debt. The average cost of debt is the weighted average of interest on debts. The debt instruments are risk-free assets of the investors, while equities are risky assets. So, return on risky assets will always be greater than the rate of interest on risk-free assets. The return to investors (shareholders) is aggregation of the dividend yield and capital gain. Furthermore, the competitive rate of return on investment must also be greater than the rate of inflation.

Mathematically, the return on equity will always be greater than the return on assets (or equal to return on assets, in unlevered firm). It implies that the difference between the return on equity (risky assets) and weighted average cost of debt (return on risk-free assets). This rate of return ignores the capital gain on financial assets which is determined by the market. The competitive rate of return does not mean a required rate on investment or an 'efficient' rate of return which indicates one of the highest rates of return in the market. This concept can be explained through the following expressions:

$$ROA = \frac{EAT}{TOTAST} \tag{1}$$

$$ROE = \frac{EAT}{EQTY} \tag{2}$$

$$While, \quad TOTAST = EQUITY + LTDBT + CURLBL \tag{3}$$

$$\therefore ROE \geq ROA \tag{4}$$

$$\therefore ROD = ROE - ROA \tag{5}$$

While 'ROA' is the return on total assets, 'ROE' is the return on equity, 'ROD' is the employed cost of debt including cost of short-term financing if any. 'EAT' is earnings after tax, 'TOTAST' is total assets of a firm, 'EQUITY' is owners' equity, 'LTDBT' is long-term debt and 'CURLBL' is current liabilities. This model is subject to positive earnings after tax.

The leverage position of a firm indicates the share of debt in the employed capital of a firm. The leverage ratio of a firm can be calculated in different ways. The equity multiplier which is calculated by dividing a company's total asset by its total equity is one of the widely used measures to calculate the leverage ratio. A high equity multiplier indicates that a company is using a high amount of debt to finance its assets. A low equity multiplier means that the company has less reliance on debt. Similarly, long-term debt-to-equity ratio and total debt-to-equity ratio are also used to measure the leverage position of a firm. In this study, we applied 'Equity multiplier' as an indicator of leverage position. The higher share of debt in employed capital indicates the liability of repayments of principal amount, interest payment, and other financial services attached to the debt financing. It may be an indicator of default risk.

Financial liquidity is defined as the ease at which an asset can be converted into cash. Fixed assets, inventories, and receivables cannot be easily converted into cash, so they are not considered liquid assets. However, liquid and illiquid current assets constitute the working capital that is required for day-to-day payments for running business activities. It is hypothesized in this study that a lower level of liquid assets affects the dividend payment negatively. Consequently, the shareholders will receive a lesser dividend on their investment. It will affect the financial competitiveness of the firm.

In this study, we have not considered capital gain (or market value of shareholders' equity). The return on investment is estimated through return on equity (ROE) and cash dividend (DVDND) as a percentage of equity (EQTY). The return on assets (ROA) has been estimated to compare the return on risky assets (equity) with the return on risk-free assets (lending). A firm will be financially competitive if its return on equity (ROE) is greater than the return on debt (ROD) subject to a rate of inflation that should be lower than the return on equity. Ideally, cash dividends as a percentage of owners' equity should be greater than return on debt financing (ROD). However, if a firm requires its expansion through internal financing (retained earnings), then cash dividend (DVDND) will be lower. In this case, the firm will be classified as 'uncompetitive' from the short-term investors' point of view. However, for long-term investors, this classification will be based on return on equity (ROE). The higher positive difference between return on equity (ROE) and return on debt (ROD) will mobilize the investors to equity participation, which is a good indicator of expansion in businesses.

The lower amount of equity (EQTY) as compared to the size of the firm (total assets) indicates higher leverage (LVRG) or debt financing. In this study, we have explored also the determinants of leverage ratio (LVRG) and long-term borrowing (LTBWRNG).

Table 1: Origin of Debt Financing: 2023

Country/ Region/ Group	Share of private sector in total external debt	Domestic credit to private sector (% of GDP)	Domestic credit to private sector by banks (% of GDP)
Bangladesh	9.0	37.6	37.5
India	43.8	50.1*	50.1*
Pakistan	13.3	12.0	11.9
South Asia	33.4	46.4*	46.4*
Middle income	30.2	135.6	128.8
World		146.5	94.3
Lower middle income	25.9	46.5*	46.0*
High income		153.0	75.3
*' 2021			

Source: World Bank (2023 and 2024)/ Author's calculations

Figure 2: Liquidity and Dividend on Equity

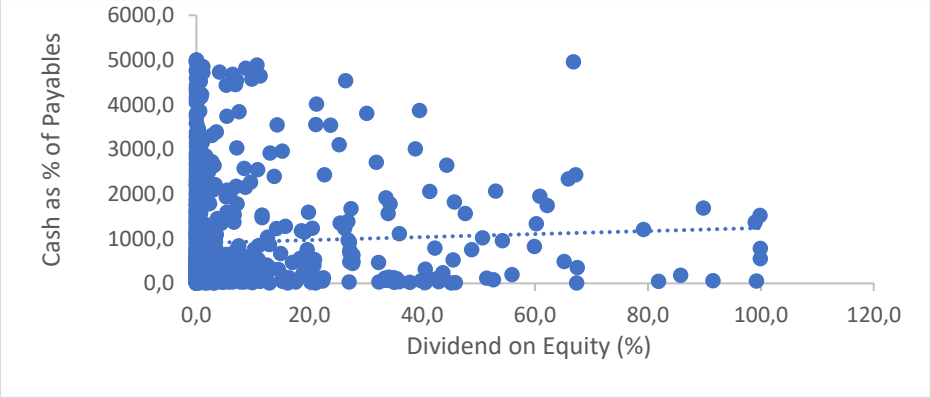


Figure 3: Liquidity and Leverage

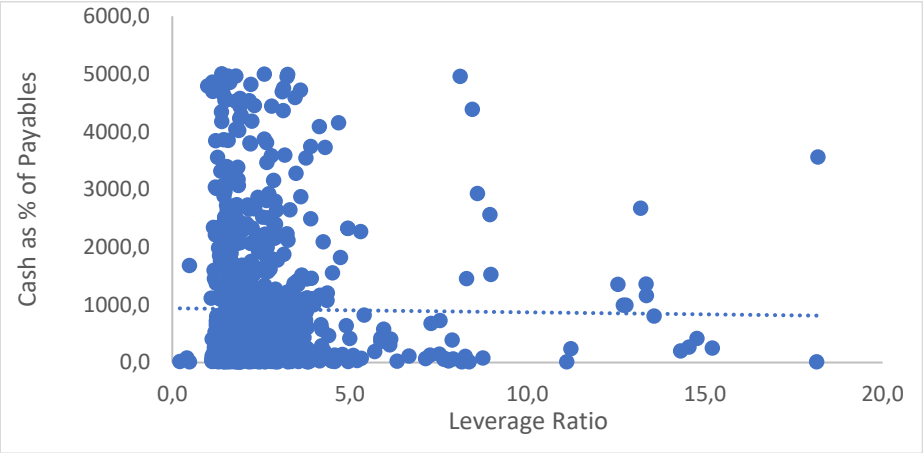


Figure 4: Dividend on Equity and Leverage

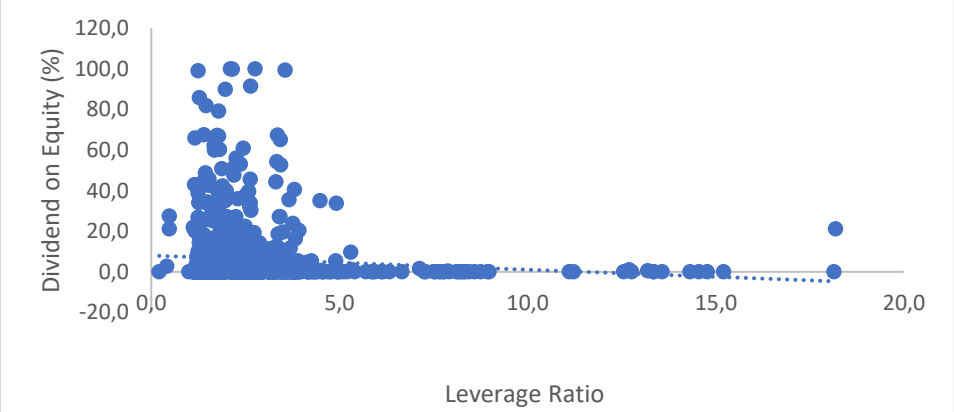


Figure 5: Return on Equity and Leverage

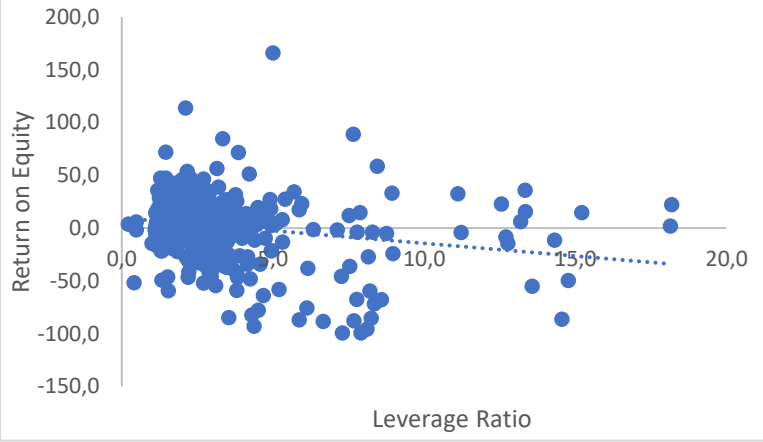
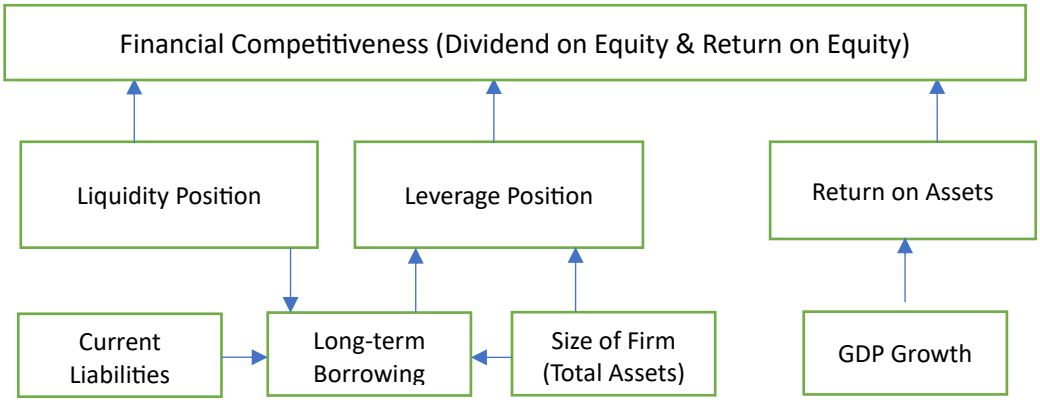


Figure 6: Impacts of Leverage and Liquidity on Financial Competitiveness



4. METHODOLOGY TO DETERMINE THE FACTORS OF FINANCIAL COMPETITIVENESS

This analysis is based on 6 years data from 398 listed companies in Pakistan. The data has been extracted from the annual reports of those companies (SBP: 2023). The reported data in annual accounts are based on standard accounting policies and procedures. The definitions of some variables in accounting procedures are different from finance theory. So, before applying the statistical techniques for empirical findings, some variables have been re-calculated. In this analysis, preference shares capital is not a part of owners' equity. Similarly, a surplus on the revolution of assets has been treated as a separate variable that is not included in equity.

Table: 2 shows the classification of companies in the sample. This table shows that 116 out of 398 companies are classified as small and medium enterprises. The classification of companies is based on the definition of small and medium enterprises (SME) in the latest SME policy formulated by the Government of Pakistan (2021). According to this definition, a company will be considered a small or medium enterprise if its annual sale is less than 800 million Pak rupees (PKR). In this case, the company will be qualified to avail those advantages which are available to small and medium enterprises in Pakistan. The ease of compliance with regulatory and listing requirements and concessional borrowing from commercial banks are included in these advantages. To capture the effect of SME status on financial competitiveness, a dummy variable has been created. The numeric value of this dummy variable is equal to '1' if a company is classified as small or medium enterprise (SME) and '0' otherwise.

The data for some variables is not available in some cases. The number of observations for each regression has been reported in the results. All data has been reported in thousands of rupees (PKR) unless specified.

Table: 3 summarizes the macroeconomic situation from 2016 to 2021. The higher fluctuation in GDP is envisaged in Table: 5, while the rate of inflation also highly fluctuated during the period (2016 to 2021). The Covid-19 pandemic is one of the causes of fluctuation in growth and inflation. However, no significant improvement in domestic credit was observed.

The descriptive statistics in Table: 4 summarize the structure of the data. This table shows the differences in the financial positions of large-scale companies and small and medium enterprises (SMEs). It is envisaged that differences in leverage financing affect profitability. The list of variables with their abbreviated names and sources of data has been presented in Table: 5.

The association between liquidity position, leverage financing, and payments of dividends have been shown in Figures: 2 and 3, while Figures: 4 and 5 show the relation of leverage position with dividend and return on equity. These charts show the apparent relations among these variables. However, statistical inferences have been ascertained in section 5. In the presentation of graphic sketches of data, we have excluded the outliers. We have not included the observations where the annual return on equity or dividend payment is more than 100% of the equity. Similarly, we have not included the observations where net losses in a year are greater than the equity of a firm. The observations where the leverage ratio is greater than 20 or cash is more than 5000% of payables are not included in the analysis.

It is mentioned in the earlier section that financial competitiveness has been measured through return on equity (ROE) and cash dividend to equity (DVDND/EQTY) ratio. For a competitive firm, the return on equity (ROE) and cash dividend to equity (DVDND/EQTY) ratio should be higher than the cost of debt (ROD). It is hypothesized that the returns on equity (ROE) and the cash dividend (DVDND) are affected by leverage financing (LVRG and LTBWRNG) and the liquidity position of a firm (CASH).

We have tested how return on equity (ROE) and dividend on equity (DVDND/EQTY) are determined by leverage (LVRG) financing and the size of the firm. The total assets (TOTAST) indicate the size of a firm. The large size in terms of total assets (TOTAST) requires more financing. So, total assets (TOTAST) are included in the explanatory factors of leverage financing (LVRG) and long-term borrowing (LTBWRNG). The available cash and bank balance (CASH), current liabilities (CURLBL), and short-term payables (PAYBL) are also included in the explanatory factors of cash dividend (DVDND), leverage financing (LVRG), and long-term borrowing (LTBWRNG).

It has been noted (Mehar: 2007, 2022) that the majority of large-scale units in Pakistan produce industrial raw materials and intermediate products (like fibers, yarn, gray cloth, plastic, and basic chemicals, etc.) while small and medium enterprises convert these intermediate goods into finished products. In this way, small and medium enterprises (SMEs) have to invest their capital in current assets: inventories (INVNTRY), and trade credits (RCVBLS), while large-scale industries focus mainly on the acquisition of fixed assets (FXDAST). So, lower-level liquid assets (CASH) in small and medium enterprises (SMEs) are a natural phenomenon. To capture the impact of this phenomenon, the dummy variable (SME) is included in the explanatory variables. The impacts of explanatory factors on return on assets (ROA), return on equity (ROE), cash dividend to equity (DVDND/EQTY) ratio, leverage ratio (LVRG), and long-term borrowing (LTBWRNG) can be explained in the following equations:

$$ROE_{it} = \beta LVRG_{it} + \gamma GROW_{it} + \Omega SME_{i} + \delta X_{it} + \mu_{i} + \tau_{t} + \epsilon_{it}$$

$$\left(\frac{DVDND}{EQTY}\right)_{it} = \beta LVRG_{it} + \gamma\left(\frac{CASH}{PAYBL}\right)_{it} + \Omega SME_{i} + \delta X_{it} + \mu_{i} + \tau_{t} + \epsilon_{it}$$

$$LVRG_{it} = \beta TOTAST_{it} + \gamma INTRPMT_{it} + \Omega SME_{i} + \delta X_{it} + \mu_{i} + \tau_{t} + \epsilon_{it}$$

$$LTBWRNG_{it} = \beta TOTAST_{it} + \gamma CURLBL_{it} + \Omega CASH_{it} + \delta X_{it} + \mu_{i} + \tau_{t} + \epsilon_{it}$$

$$ROA_{it} = \beta GROW_{it} + \gamma DCPS_{it} + \Omega SME_{i} + \delta X_{it} + \mu_{i} + \tau_{t} + \epsilon_{it}$$

It is mentioned earlier that return on equity (ROE) and payment of cash dividends to investors (DVDND/EQTY) are the primary indicators of the financial competitiveness of a firm. The above-mentioned equations show the direct effects of leverage financing (LVRG) on return on equity (ROE) and cash dividend to equity (DVDND/EQTY) ratio while the indirect effects of the size of a firm (TOTAST) on return on equity (ROE) and cash dividend to equity (DVDND/EQTY) ratio can be expressed as follows:

$$\frac{dROE}{dTOTAST} = \frac{\partial ROE}{\partial LVRG} \cdot \frac{\partial LVRG}{\partial TOTAST}$$

$$\frac{d\left(\frac{DVDND}{EQTY}\right)}{dTOTAST} = \frac{\partial\left(\frac{DVDND}{EQTY}\right)}{\partial LVRG} \cdot \frac{\partial LVRG}{\partial TOTAST}$$

Where 'ROA' is the return on assets of company 'i' in year 't', 'ROE_{it}' is the return on equity of company 'i' in year 't', '$LVRG_{it}$' is leverage ratio of company 'i' in year 't', 'SME_i' is a dummy variable equal to '1' if a company 'i' is classified as a small or medium enterprise, and '$EQTY_{it}$' is the owners' equity of company 'i' in year 't'. '$GROW_t$' is the annual growth of GDP in percentage in year 't' and '$DCPS_t$' is the domestic credit to the private sector in year 't'. '$CASH_t$' indicates the cash and bank balance of a company at the end of the year of company 'i' in year 't', '$TOTAST_{it}$' is the total assets of company 'i' in yer 't', and '$DVDND_{it}$' indicates cash dividend paid by company 'i' in year 't' to its shareholder. '$PAYBL_{it}$' is accounts and notes payable by company 'i' in year 't', '$LTBWRNG_{it}$' is long-term borrowing of company 'i' in year 't', '$INTRPMT_{it}$' is interest payment by company 'i' in year 't' and '$CURLBL_{it}$' is current liabilities of company 'i' in year 't'.

'X_{it}' is a vector of exogenous control variables; 'μ_i' denotes unobserved time-invariant heterogeneity at the country level; 'τ_t' is a country-fixed effect; and 'ε_{ijt}' is an independent disturbance term. The descriptions of variables and sources of data have been shown in Table: 5.

Several control variables to estimate the net effects of the size of a company (TOTAST), leverage financing (LVRG), and liquidity position (CASH/PAYBL) on return on equity (ROE) and dividend to equity ratio (DVDND/EQTY) have been included in the estimations. These relations can be expressed in the following 5 equations:

$$ROE_{it} = \propto_i + \beta_1 LVRG_{it} + \beta_2 GROW_{it} + \beta_3 SME_i + \varepsilon_{it} \quad (5)$$

$$(\frac{DVDND}{EQTY})_{it} = \propto_i + \beta_1 LVRG_{it} + \beta_2(\frac{CASH}{PAYBL})_t + \beta_3 SME_i + \varepsilon_{it} \quad (6)$$

$$LVRG_{it} = \propto_i + \beta_1 TOTAST_{it} + \beta_2 INTRPMT_{it} + \beta_3 SME_i + \beta_4 SURVULTN_{it} + \varepsilon_{it} \quad (7)$$

$$LTBWRNG_{it} = \propto_i + \beta_1 TOTAST_{it} + \beta_2 CASH_{it} + \beta_3 CURLBL_{it} + \beta_4 INTNGBL_{it} + \varepsilon_{it} \quad (8)$$

$$ROA_{it} = \propto_i + \beta_1 GROW_{it} + \beta_2 DCPS_{it} + \beta_3 SME_i + \varepsilon_{it} \quad (9)$$

$INTNGBL_{it}$ indicates intangible assets of company i in year t and $SURVULTN_{it}$ is the surplus on the revolution of assets of company i in year t.

Panel least square (PLS) techniques have been applied to estimate the parameters. The Hausman (Cross-section random chi-square) and Lagrange Multiplier (Breusch-Pagan, Honda, King-Wu) tests have been applied to test the appropriateness of panel least square (PLS) techniques. Based on these criteria, the fixed effect models have been used for the estimation of return on equity (ROE), return on assets (ROA), leverage ratio (LVRG), and long-term borrowing (LTBWRNG), while the common effect model was suggested for the estimation of dividend to equity ratio (DVDND/EQTY). Every equation has been estimated in 3 alternative scenarios. The objective of estimation in alternative scenarios is to check the robustness of parameters.

For the selection of an appropriate model to minimize the information losses, the Akaike, Schwarz, and Hannan-Quinn information criteria have also been reported in the results.

Table 2: Sample Specification (Year: 2016-22)

Sector/ Category	No. of Companies
Total	398
Large-scale Enterprises	282
Small and Medium Enterprises (SMEs)	116
Manufacturing Sector	381
Services Sector	17

Source: State Bank of Pakistan (2023 and 2024)/ Author's presentation

Table 3: Macroeconomic Factors

Year	Domestic Credit to Private Sector (% of GDP)	GDP growth (%)	Rate of inflation-Consumer Prices (%)
2016	14.68	5.53	3.77
2017	15.31	4.43	4.85
2018	16.63	6.15	5.79
2019	15.69	2.50	1.58
2020	15.33	-1.27	9.74
2021	15.35	6.49	9.50
2022	14.80	4.78	19.9
2023	12.00	-0.04	30.8

Source: World Bank (2024)

Table 4: Financial and Operational Indicators (Descriptive Statistics (In million PKR unless specified)

Variable	Large Scale Companies			Small and Medium Enterprises		
	Mean	Median	Std.Error	Mean	Median	Std.Error
Return on assets	3.5	2.4	0.7	0.2	1.4	0.4
Return on equity	13.1	9.0	2.9	13.3	3.1	12.8
Dividend paid: cash	831.1	68.9	95.3	219.1	17.7	39.1
Dividend paid: Bonus shares	194.3	29.3	58.4	48.1	13.2	15.0
Earning after tax	1024.1	96.7	213.8	256.8	2.6	117.1
Owners' equity	6657.3	1295.0	1178.3	1619.4	232.2	216.6
Total assets	21653.6	3453.1	2231.7	4626.8	569.5	1041.2

Leverage ratio	2.3	2.2	0.4	1.6	1.9	0.6
Long-term borrowing	3182.6	232.5	545.6	554.8	78.3	82.7
Cash and bank balance	758.6	62.8	86.1	124.1	9.8	19.4
Payables	5576.7	553.1	731.4	654.1	122.3	99.7
Receivables	5162.3	289.3	800.8	490.8	48.6	147.8
Interest expenses as % of EAT*	42.8	13.7	2280.1	9.0	0.2	562.0
Interest expenses as % of long-term borrowing*	16.9	14.2	697697.6	6.2	18.6	6375.3
Fixed Assets at cost	9461.7	1754.7	862.4	2186.9	422.6	245.2
Intangible assets	482.6	6.4	90.9	71.3	2.9	22.9
Operating assets after depreciation	6375.1	1436.5	566.1	1717.4	309.6	187.5
Paid up capital	1582.1	122.7	173.6	469.2	28.7	85.0
Surplus on the revolution of assets	1512.1	358.2	190.6	649.9	214.9	77.3
*’ Including other financial charges and Ignoring negative EAT or EBT						

Table 5: List of Variables and Sources of Data (Million PKR, if not specified)

Abbreviation	Description	Source
CASH	Cash and bank balance	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
CURLBL	Current liabilities	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
DCPS	Domestic credit to private sector as % of GDP	International Financial Statistics, International Monetary Fund (2023)
DVDND	Cash dividends	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
EAT	Earing after tax	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
EQTY	Shareholders' equity (excluding preference shares capital)	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
FB	The dummy variable is equal to '1' if a company belongs to fibers manufacturing (including silk, synthetic, rayon, nylon and polyester) and '0' otherwise	Author’s depiction based on State Bank of Pakistan (2023)
FXDAST	Fixed assets at cost	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
GR	The dummy variable is equal to '1' if a company belongs to garments manufacturing and '0' if otherwise	Author’s depiction based on State Bank of Pakistan (2023)
GROW	GDP growth (annual %)	World Development Indicators; World Bank (2023)
ICT	The dummy variable equal to '1' if a company belongs to information and communication technology and '0' otherwise	Author’s depiction based on State Bank of Pakistan (2023)
INFLCPI	Rate of inflation based on consumer prices (annual %)	World Development Indicators; World Bank (2023)
INTNGBL	Intangible assets are defined as assets that cannot be seen, touched, or physically measured. These are created through time and/or effort. Copyrights, patents, goodwill, trademarks, and software accounts are included in these assets.	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
INTRPMT	Interest payment (Total interest paid)	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)

LTBWRNG	Long-term borrowing including bonds, debentures, and institutional borrowing	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
LVRG	Leverage ratio: Ratio of total assets to shareholder's equity	Author's calculations
OPRASTN	Operating fixed assets after deducting accumulated depreciation	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
PAIDUP	Paid-up capital (Ordinary shares capital)	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
PAYBLS	Trade credit and other accounts payables	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
PAYOUT	Cash dividend to earning after tax	Author's calculations
ROA	Return on Assets (Earning after tax as % of total assets)	Author's calculations
ROE	Return on equity (Earning after tax as % of equity)	Author's calculations
SME	The dummy variable is equal to '1' if the annual sales revenue of the company is less than Rs.800 million, and '0' otherwise.	Author's depiction based on the Government of Pakistan (2021)
SP	The dummy variable is equal to '1' if a company belongs to textile spinning and/or weaving and '0' if otherwise	Author's depiction based on State Bank of Pakistan (2023)
SRV	The dummy variable is equal to '1' if a company belongs to the services sector and '0' if otherwise	Author's depiction based on State Bank of Pakistan (2023)
SRVLUTN	Surplus on revaluation of fixed assets	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
TAX	Tax provision	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)
TOTAST	Total Assets (Equity & Liabilities)	Financial Statement Analysis; State Bank of Pakistan/ Pakistan Stock Exchange (2023)

5. RESULTS AND EMPIRICAL PIECES OF EVIDENCE

Tables: 6 to 10 present the statistical results of the above-mentioned equations. These results quantify the impacts of explanatory variables and indicate the significance of parameters and overall goodness of fit in the equations. To conduct the falsification test, additional control variables have been added. The results are confirmed by 3 alternative scenarios. Another, objective of testing the models in alternative scenarios by adding and subtracting the control variables is to test the robustness of the estimated parameters.

The adjusted R-squares and F-statistics show the goodness of fit in all estimated equations, indicating that the explanatory variables included in the models significantly explain the effects of independent variables. All the equations in the models are well-fitted, as confirmed by the adjusted R-squares and F-statistics. The magnitudes of the Akaike information criterion, Schwarz criterion, and Hannan-Quinn criterion have also been reported. The Lagrange Multiplier Tests (Breusch-Pagan, Honda, and King-Wu) and Hausman justify the selection of panel least square (PLS).

Based on empirical analysis, it is concluded that leverage financing (LVRG) and liquidity position (CASH) play important and significant roles in determining financial competitiveness. Table: 6 depicts that higher leverage financing (LVRG) is a major cause of diluting the financial competitiveness. Though theoretical pieces of evidence support the favorable role of debt financing in improving the value of a firm (Miller and Modigliani: 1958; Miller and Modigliani: 1961; Mehar: 2005a; Mehar: 2005c), it is not supported by the empirical pieces of evidence in this study. However, the estimation of dividend to equity ratio (DVDND/EQTY) reconciles the empirical evidence with the theory of finance.

Table: 7 shows a positive impact of debt financing (LVRG) on the dividend-to-equity ratio (DVDND/EQTY). Similarly, the liquidity position (CASH/PAYBL) is a cause of improvement in dividend payment (DVDND/EQTY). The reconciliation of these two results

corroborates that debt financing dilutes the return on equity (ROE) but it provides a substitute for internal financing (retained earnings). So, in the presence of debt financing, companies can use their earnings (EAT) for payment of cash dividends (DVDND).

Tables: 8 and 9 show that the size of a firm in terms of its total assets (TOTAST) is a significant factor in debt financing (LVRG). Large companies prefer more debt financing (LVRG). This conclusion was confirmed through two different equations. In Table: 8 the dependent variable was leverage ratio (LVRG), which is a ratio of total assets (TOTAST) to equity (EQTY). The higher leverage ratio indicates the higher investment by a firm about its equity (EQTY). The dependent variable is long-term borrowing (LTBWRNG) in Table: 9. The long-term borrowing (LTBWRNG) is a part of employed capital which is used for investment in fixed assets. The effect of total assets (TOTAST) was the same in both cases.

Empirical pieces of evidence show that current liabilities (CURLBL) are used as a substitute for long-term borrowing (LTBWRNG). Interestingly, current liabilities (CURLBL) are those short-term obligations that are due within the year. These liabilities are generated through buying on credit or delay in the payments of employees' benefits, utility bills, and notes payables. The higher magnitude of these short-term liabilities (CURLBL) is negatively associated with long-term borrowing (LTBWRNG). The good liquidity position (CASH) of a firm is also negatively associated with long-term borrowing (LTBWRNG). Interestingly, the impact of intangible assets (INTNGBL) on long-term borrowing (LTBWRNG) is negative.

It is noted that growth in GDP (GROW) is the only significant factor of return on assets (ROA). The return on assets reflects the earning power of its assets. It implies that the earnings of a firm regardless of its size are mainly determined by the economic conditions. It recognizes the importance of macroeconomic conditions.

We have tested the impacts of specific characteristics of different industrial sectors by incorporating their dummy variables. The textile spinning and weaving sector (SP), textile fiber (FB), information and communication services (ICT), garments manufacturing (GR) and services industries (SRV) have been incorporated into the equations through their respective dummy variables. However, it is noted that the effects of the special characteristics of these industries are not significant. Similarly, the special status of small and medium enterprises (SMEs) is not an important factor in determination of the financial competitiveness. It is the leverage financing, size of the firm, and liquidity position that determines the financial competitiveness of a firm.

It is evident in summary statistics (table: 4) that the return on equity in small and medium enterprises is higher than in large-scale industrial units despite very low returns on assets in small and medium enterprises. It is corroborated by a comparison of their leverage ratios. The leverage financing of large-scale enterprises is higher than small and medium enterprises. In interpreting the summary statistics and regression results it is noteworthy that it is not the size of enterprises that differentiates financial competitiveness. The real source of this differentiation is the magnitudes of leverage financing and liquidity position of enterprises. In the case of alternative arrangements for leverage financing and liquidity management, there will be no difference between large-scale units and small and medium enterprises.

Table 6: Dependent Variable: Return on equity (ROE)

Method: Panel Least Squares (Fixed Effect Model)
Sample: 2016-2022
Periods included: 7; Cross-sections included: 331; Total panel (unbalanced) observations: 1957

Independent Variable/ Option	**I**	**II**	**III**
Constant	22.344***	-5.690	-5.609
	(3.252)	(-0.066)	(-0.065)
SME: Dummy variable equal to '1' for SMEs	14.062	14.096	14.521
	(1.565)	(1.568)	(1.592)
SME*ICT: Dummy variable for SMEs*Dummy variables for ICT companies	36.056	36.290	35.872
	(0.783)	(0.788)	(0.778)
LVRG: Leverage ratio	-12.597***	-12.596***	-12.596***
	(-52.279)	(-52.255)	(-52.235)
FXDAST: Fixed assets at cost	2E-07	2E-07	2E-07
	(1.146)	(1.150)	(1.147)
GROW: GDP growth (%)	1.822	1.761	1.765
	(1.517)	(1.450)	(1.452)
DCPS: Domestic credit to private sector as % of GDP		1.822	1.821
		(0.328)	(0.328)

SME*SRV: Dummy variable for SMEs*Dummy variable for companies in the services industry			-15.297 (-0.280)
Overall Significance			
R-squared	0.718	0.718	0.718
Criteria for Model Selection			
Akaike information criterion	12.795	12.797	12.798
Schwarz criterion	13.779	13.783	13.788
Hannan-Quinn criterion	13.159	13.161	13.164
Testing for Fixed/ Random/ Common Effect			
Lagrange Multiplier Test: Breusch-Pagan	21.029***	21.051***	21.060***
Lagrange Multiplier Test: Honda	4.5857***	4.5881**	4.589**
Lagrange Multiplier Test: King-Wu	4.5857***	4.5881**	4.589**
Hausman Test (Cross-section random Chi-Square)	41.872***	41.912***	41.961***
#T-Statistics in parenthesis *p < 0.1; **p < 0.05; ***p < 0.01			

Table 7: Dependent Variable: Cash Dividend to Equity (DVDND/EQTY)

Method: Panel Least Squares (Common Effect Model)
Sample: 2016-2022
Periods included: 7; Cross-sections included: 236; Total panel (unbalanced) observations: 972

Independent Variable/ Option	**I**	**II**	**III**
Constant	1.750 (1.973)	0.135 (0.116)	-1.413 (-0.071)
ROE: Return on equity (after tax)	0.009 (0.993)	0.046** (2.431)	0.007 (0.734)
CASH/PAYBLS: Cash and bank balance to Trade credit and other accounts payables	0.194*** (11.311)	0.194*** (11.333)	0.228*** (11.344)
SME: Dummy variable equal to '1' for SMEs	-0.786 (-0.550)	-0.507 (-0.353)	0.047 (0.027)
ICT: Dummy variable equal to '1' for ICT companies	-5.378 (-1.508)	-5.250 (-1.474)	-8.312* (-1.933)
SRV: Dummy variable equal to '1' for companies in the services industry	-3.544 (-0.802)	-3.137 (-0.710)	-4.952 (-0.917)
GR: Dummy variable equal to '1' for companies in garment manufacturing	-1.065 (-0.176)	-0.968 (-0.160)	-1.434 (-0.211)
SP: Dummy variable equal to '1' for companies in textile spinning and weaving	-1.541 (-0.974)	-1.297 (-0.816)	-1.721 (-0.961)
FB: Dummy variables equal to '1' for companies in fiber manufacturing	-1.511 (-0.270)	-1.063 (-0.190)	-1.879 (-0.263)
TOTAST: Total Assets		-2E-10 (-0.025)	
INTRPMT/LTBWRNG: Interest payments to long-term borrowing			3E-07 (0.070)
LVRG: Leverage ratio		0.369** (2.225)	
DCPS: Domestic credit to private sector as % of GDP			0.200 (0.155)
Overall Significance			
R-squared	0.122	0.126	0.150
Criteria for Model Selection			
Akaike information criterion	8.830	8.829	8.959
Schwarz criterion	8.875	8.884	9.027

Hannan-Quinn criterion	8.847	8.850	8.985
Testing for Fixed/ Random/ Common Effect			
Lagrange Multiplier Test: Breusch-Pagan	0.293	0.051	0.234
Lagrange Multiplier Test: Honda	0.541	0.227	0.484
Lagrange Multiplier Test: King-Wu	0.541	0.227	0.484
#T-Statistics in parenthesis *p < 0.1; **p < 0.05; ***p < 0.01			

Table 8: Dependent Variable: Leverage ratio (LVRG)

Method: Panel Least Squares (Fixed Effect Model)
Sample: 2016-2022
Periods included: 7; Cross-sections included: 192; Total panel (unbalanced) observations: 1089

Independent Variable/ Option	**I**	**II**	**III**
Constant	3.642 (0.215)	1.007 (0.047)	2.136 (0.125)
SME: Dummy variable equal to '1' for SMEs	-2.812* (-1.668)	-3.288 (-1.599)	-2.738 (-1.615)
TOTAST: Total Assets	2E-07*** (4.741)	1E-07*** (4.059)	1E-07*** (4.532)
DCPS: Domestic credit to private sector as % of GDP	-0.140 (-0.129)	0.002 (0.001)	-0.051 (-0.046)
INTRPMT/EAT: Interest payments to earnings after tax	0.002* (1.722)		
INTRPMT/LTBWRNG: Interest payments to long-term borrowing		3E-04*** (4.751)	
SURVLUTN: Surplus on revaluation of fixed assets	-6E-08 (-0.254)	-1E-07 (-0.436)	-3E-09 (-0.012)
ICT*EQTY: Dummy variable for companies in ICT*Equity			6E-08 (1.101)
SP*EQTY: Dummy variable for companies in textile spinning and weaving*Equity			2E-07 (0.768)
SRV*EQTY: Dummy variable for companies in the services industry*Equity			5E-08 (0.084)
Overall Significance			
R-squared	0.238	0.287	0.237
Criteria for Model Selection			
Akaike information criterion	8.949	9.154	8.955
Schwarz criterion	9.880	10.180	9.896
Hannan-Quinn criterion	9.304	9.549	9.314
Testing for Fixed/ Random/ Common Effect			
Lagrange Multiplier Test: Breusch-Pagan	3.448*	1.934	3.438*
Lagrange Multiplier Test: Honda	1.856	1.390	1.854
Lagrange Multiplier Test: King-Wu	1.856	1.390	1.854
Hausman Test (Cross-section random Chi-Square)	46.344***	124.743***	47.403***
#T-Statistics in parenthesis *p < 0.1; **p < 0.05; ***p < 0.01			

Table 9: Dependent Variable: Long-Term Borrowing (LTBWRNG)

Method: Panel Least Squares (Fixed Effect Model)
Sample: 2016-2022
Periods included: 7; Cross-sections included: 163; Total panel (unbalanced) observations: 709

Independent Variable/ Option	**I**	**II**	**III**
Constant	5614568.0***	5709274.0***	5291863.0
	(9.995)	(8.900)	(0.428)
CURLBL: Current liabilities	-0.164***	-0.164***	-0.164***
	(-8.196)	(-8.193)	(-8.151)
CASH: Cash and bank balance	-1.615***	-1.615***	-1.618***
	(-5.734)	(-5.727)	(-5.731)
TOTAST: Total assets	0.037***	0.037***	0.036***
	(3.208)	(3.207)	(3.186)
INTNGBL: Intangible assets	-0.728*	-0.730*	-0.727*
	(-1.838)	(-1.840)	(-1.830)
SME*LVRG: Dummy variable for SMEs*Leverage ratio	-1290.1	40899.9	-7362.3
	(-0.005)	(0.142)	(-0.029)
SME: Dummy variable equal to '1' for SMEs		-423857.7	
		(-0.307)	
INFLCPI: Rate of inflation based on consumer prices			94908.1
			(0.626)
DCPS: Domestic credit to private sector as % of GDP			-15909.1
			(-0.020)
Overall Significance			
R-squared	0.668	0.668	0.668
Criteria for Model Selection			
Akaike information criterion	35.546	35.548	35.550
Schwarz criterion	36.623	36.632	36.641
Hannan-Quinn criterion	35.962	35.967	35.972
Testing for Fixed/ Random/ Common Effect			
Lagrange Multiplier Test: Breusch-Pagan	239.727***	241.358***	239.397***
Lagrange Multiplier Test: Honda	15.483***	15.535***	15.472***
Lagrange Multiplier Test: King-Wu	15.483***	15.535***	15.472***
Hausman Test (Cross-section random Chi-Square)	306.183***	304.784***	303.870***
#T-Statistics in parenthesis *p < 0.1; **p < 0.05; ***p < 0.01			

Table 10: Dependent Variable: Return on assets (ROA)

Method: Panel Least Squares (Fixed Effect Model)
Sample: 2016-2022
Periods included: 7; Cross-sections included: 328; Total panel (unbalanced) observations: 1930

Independent Variable/ Option	**I**	**II**	**III**
Constant	8.091	8.565	8.673
	(1.435)	(1.505)	(1.522)
SME*ICT: Dummy variable for SMEs*Dummy variables for ICT companies	-0.190	-0.108	-0.108
	(-0.064)	(-0.037)	(-0.037)
GROW: GDP growth (%)	0.390***	0.431***	0.432***
	(4.867)	(5.358)	(5.363)
DCPS: Domestic credit to private sector as % of GDP	-0.420	-0.464	-0.468
	(-1.148)	(-1.257)	(-1.266)
OPRASTN/TOTAST: Operating asset after depreciation to total assets	-3E-04**	-0.002	-0.002
	(-2.063)	(-0.214)	(-0.215)

TAX/TOTAST: Tax to total assets		0.009 (0.178)	0.009 (0.179)
SME*SP: Dummy variable for SMEs*Dummy variables for companies in textile spinning and weaving			-0.410 (-0.375)
Overall Significance			
R-squared	0.543	0.549	0.549
Criteria for Model Selection			
Akaike information criterion	7.354	7.341	7.342
Schwarz criterion	8.335	8.333	8.337
Hannan-Quinn criterion	7.717	7.708	7.711
Testing for Fixed/ Random/ Common Effect			
Lagrange Multiplier Test: Breusch-Pagan	683.503***	664.520***	602.774***
Lagrange Multiplier Test: Honda	26.143***	25.778***	24.551***
Lagrange Multiplier Test: King-Wu	26.143***	25.778***	24.551***
Hausman Test (Cross-section random Chi-Square)	31.859***	39.583***	59.972***
#T-Statistics in parenthesis *p < 0.1; **p < 0.05; ***p < 0.01			

6. RECOMMENDATIONS FOR POLICY MEASURES AND LIMITATIONS

From a policy formulation point of view, it is important that the size of a firm in terms of its assets, debt financing, and liquidity position are important, significant, and robust determinants of financial competitiveness. The size of a firm does not affect its competitiveness directly. Its effects are transformed through leverage financing and the liquidity position of a firm. Large firms (in terms of assets) have to depend on debt financing. Debt financing dilutes the return on equity but improves dividend payment. The payment of more dividends will affect internal financing or expansion. This situation indicates short-term improvement in financial competitiveness. For sustainable improvement in financial competitiveness, the return on equity should be improved. In the estimation of the return on assets, it is concluded that GDP growth is a significant determinant of return on assets. After subtracting the cost of debt, the return on assets is transformed into return on equity. So, macroeconomic growth is a considerable factor in improving the financial competitiveness of a firm.

From investors' point of view, it is important that dividend on equity is a measure of short-term competitiveness. It can be used by short-term investors. However, the return on equity reflects long-term competitiveness. The difference between the return on equity and dividend on equity indicates the re-investment of investors' earnings for the growth and expansion of the firm.

Another notable point is the negative association between intangible assets and debt financing. To acquire intangible assets (patents, trademarks, goodwill, copyrights, etc.) firms do not use debt financing. In fact, in the context of Pakistan and other developing countries, it indicates the participation of foreign affiliates (or parent companies). The foreign affiliate or holding companies invest their equity through intangible assets. Debt financing will not be required to acquire those assets that have been added by the shareholders as their equity. It highlights the importance of foreign investment and collaboration with international business entities.

Before finalizing the conclusion, it is notable that these results and conclusions are based on the data of companies listed on the Pakistan Stock Exchange. The Panel Least Square (PLS) technique was applied to estimate the parameters.

For extension in this study, the capital gain can be incorporated into financial competitiveness. Importantly, the dividend yield (dividend as a percentage of the market value of equity) is another way to assess the financial competitiveness of a firm. Rather than book value, it considers the market value of equity which is important for those investors who bought the shares of a company from a secondary market. They calculate return on investment based on their out-of-pocket investment. This criterion incorporates the effect of capital gain (or loss) in return on investment. However, this is not a robust criterion because of the volatility in the stock market. The frequent changes in share prices can fluctuate the estimated financial competitiveness.

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DO BOARD GOVERNANCE MECHANISMS INFLUENCE THE INTELLECTUAL CAPITAL–PERFORMANCE RELATIONSHIP? EVIDENCE FROM AN EMERGING ECONOMY

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ABSTRACT

Purpose- This study examines the influence of intellectual capital (IC) on firm performance and the moderating role of board governance mechanisms in the context of Bangladesh, an emerging economy.

Methodology- Using panel data from 100 non-financial firms listed on the Dhaka Stock Exchange over 2018–2023, IC efficiency is measured through the Modified Value-Added Intellectual Capital (MVAIC) model, while firm performance is assessed using return on assets and Tobin's Q.

Findings- The findings demonstrate that IC efficiency positively and significantly enhances firm performance, with human capital, structural capital, and capital employed efficiency being key drivers. Moreover, board characteristics, particularly board size, independence, and meeting frequency, significantly strengthen the IC–performance relationship. Earnings per share (EPS) and the price–earnings (P/E) ratio are additionally employed as alternative measures of firm performance to verify the robustness of the observed relationship.

Conclusion- The results highlight the importance of effective board governance in maximizing the benefits of IC. For managers and policymakers in emerging economies, strengthening board mechanisms and governance practices can enhance firm performance by ensuring better utilization of intangible assets. This is one of the pioneer studies to investigate the moderating role of board governance mechanisms in the IC–performance nexus within an emerging economy like Bangladesh. By employing the MVAIC model, it offers novel evidence on how board attributes shape the effectiveness of IC in an emerging economy context.

Keywords: Intellectual capital, firm performance, board characteristics, emerging economy, modified value added intellectual capital
JEL Codes: G34, L25, O34

1. INTRODUCTION

Global business is growing very fast, fueled by advances in technology, science and intense international rivalry (Soewarno & Tjahjadi, 2020). To have some comparative advantage, firms need to formulate unique strategic planning including their internal and external resources. Combination of tangible and intangible resources will make a firm more eligible for strategic advantage (Ruta, 2009). In resource based theory, it is observed that there is a link between intangible resources and corporate performance. Even, proper management of intangible asset like intellectual capital (IC) facilitates the increase in corporate performance (Soewarno & Tjahjadi, 2020; Tan et al., 2008; Vo & Tran, 2021).

IC is not recorded in conventional financial statements, as it lacks a physical or monetary form. Nevertheless, it encompasses key organizational capabilities such as human capital, internal systems, innovation, and external relational assets (Vo & Tran, 2021). A growing body of literature has attempted to evaluate the relationship between IC and firm performance, but the results remain inconclusive. While several studies report a positive and significant association (Demartini & Beretta, 2020; Mondal & Ghosh, 2012; Smriti & Das, 2018; Vo & Tran, 2021; Wang et al., 2021), others find a negative (Ting et al., 2020) or insignificant relationship (Bala et al., 2024; Shah et al., 2024). The inconsistency in these findings may be attributable to differences in IC measurement models and the economic contexts in which the studies were conducted (Nadeem et al., 2017).

To address these gaps, the present study adopts the Modified Value Added Intellectual Capital (MVAIC) model, an enhanced version of the traditional VAIC, to more comprehensively assess the efficiency of IC. To measure firm performance, two widely

accepted indicators are used: Return on Assets (ROA), which captures internal operational efficiency, and Tobin's Q, which reflects market valuation and investor expectations, including intangible value. This dual approach allows for a more robust and multidimensional understanding of performance.

This research is situated in the context of Bangladesh, a developing South Asian economy where the role and effectiveness of intangible assets, particularly IC, remain underexplored. Existing empirical studies on IC efficiency in Bangladesh are largely limited to the banking sector and primarily rely on traditional VAIC models (Faruq *et al.*, 2023; Majumder *et al.*, 2023; Mollah and Rouf, 2022; Nabi *et al.*, 2020;). Notably, Faruq *et al.* (2023) is one of the few exceptions that incorporates a modified measurement approach. In contrast, this study focuses on the manufacturing sector, which represents a significant and growing segment of Bangladesh's economy. By examining 100 publicly listed non-financial firms on the Dhaka Stock Exchange (DSE) over the period 2018 to 2023, this research seeks to fill a critical gap in the literature.

The first objective of this study is to investigate the association between IC efficiency, as measured by MVAIC, and firm performance. The second objective is to explore the moderating role of board characteristics in this relationship. Board characteristics including board size, independence, gender diversity, and meeting frequency serve as key governance mechanisms that may influence how effectively IC is managed and utilized (Bharathi Kamath, 2019; Rositha *et al.*, 2019). Therefore, the study seeks to answer the following research questions:

RQ1: Is there any relationship between MVAIC and firm performance?

RQ2: Does the board characteristics moderate the relationship between MVAIC and firm performance?

To test the proposed hypotheses, the study employs a random effects panel regression model using firm-year observations from 2018 to 2023. The results reveal that MVAIC has a significant positive relationship with firm performance. Component-wise analysis indicates that human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE) are positively associated with profitability, whereas relational capital efficiency (RCE) shows no significant effect. Furthermore, board characteristics like specifically board size, board independence, and board performance are found to significantly moderate the IC–performance relationship, underscoring the role of governance in enhancing the value derived from intangible assets.

The contribution of this study is threefold. First, it extends the literature on IC by shifting the focus beyond the commonly examined financial sector and applying the MVAIC model to the manufacturing sector of Bangladesh, an area that has received limited empirical attention. This broader sectoral coverage enriches our understanding of IC efficiency across diverse industries in an emerging market context. Second, the study provides disaggregated insights into the impact of individual components of IC namely HCE, SCE, RCE, and CEE on firm performance. Third, and most importantly, this study is among the pioneering empirical investigations to examine the moderating role of board characteristics (board size, independence, gender diversity, and board activity) in the relationship between IC and firm performance in a developing country context. While prior studies have largely focused on the direct effects of IC or board attributes, few have integrated governance mechanisms as moderators in the IC–performance nexus. By doing so, this study fills a critical gap in the literature and highlights the strategic importance of effective board governance in enhancing the value-generating potential of IC. These contributions not only advance theoretical understanding of how IC and governance interact to influence firm outcomes but also offer practical insights for corporate managers, boards, and policymakers aiming to improve firm performance through better IC management and governance alignment.

The remainder of the study is organized as follows: Section 2 and 3 explain the theoretical framework and previous literature with hypotheses. Section 4 demonstrates the research method of the study by discussing the sample, variables and models. Results of descriptive statistics, correlation and regression are discussed in section 5. Section 6 provides the detailed discussion of the findings. Lastly, section 7 draws the conclusion of the study by discussing the implications, limitations and areas of future research.

2. THEORETICAL FRAMEWORK

This study is grounded in the Resource-Based View (RBV) of the firm, a strategic management theory that emphasizes the role of internal resources and capabilities in achieving and sustaining competitive advantage. The RBV posits that not all resources contribute equally to competitive advantage; only those that are valuable, rare, inimitable, and non-substitutable (collectively referred to as the VRIN criteria) can lead to superior firm performance (Barney, 1991; Wernerfelt, 1984). According to this perspective, a firm's performance is not solely determined by external market conditions but is also shaped by its ability to strategically acquire, develop, and deploy internal resources (Ting et al., 2020). In the context of modern knowledge-driven economies, IC has emerged as one of the most critical intangible assets of a firm. Unlike tangible assets such as land, machinery, or physical inventory, IC is embedded in employees' expertise, organizational routines, internal processes, innovation capabilities, and external stakeholder relationships. Although IC is not directly reported on financial

statements, its strategic importance lies in its capacity to create, sustain, and transfer knowledge throughout the organization, ultimately enhancing value creation (Soewarno & Tjahjadi, 2020).

The RBV provides a compelling justification for why IC should be central to strategic management. As an intangible asset, IC fulfills all four VRIN attributes. It is valuable because it enables firms to improve efficiency and innovation; it is often rare, especially in firms with specialized knowledge or unique organizational cultures; it is difficult to imitate, due to its embeddedness in social and organizational contexts; and it is non-substitutable, as knowledge-based competencies cannot be easily replaced with other types of resources (Barney, 1991). Therefore, firms that can effectively manage and leverage their IC are more likely to achieve sustained competitive advantage and superior performance outcomes.

Furthermore, the effective utilization of IC requires not only its presence but also strategic alignment and managerial capability to harness its full potential. This is where the role of governance mechanisms, particularly the board of directors, becomes crucial. Boards are responsible for overseeing the strategic direction of the firm and ensuring that resources, including IC, are aligned with organizational goals. Prior studies suggest that board characteristics such as size, independence, gender diversity, and meeting frequency can influence how effectively IC is managed and integrated into strategic decision-making (Kamath, 2019; Rositha et al., 2019). Thus, the RBV framework supports the argument that the impact of IC on firm performance is not only direct but also contingent upon the quality and effectiveness of the governance structures that support it.

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.1. Intellectual Capital

IC and its composition have a different meaning towards the academician. IC is an intangible asset which increases the value of a firm and not reported in the financial report directly (Mondal & Ghosh, 2012; Xu & Liu, 2020). IC is one of the factors for production in a knowledge-based society, giving competitive advantages to the firms and enable them to increase profit from that facilities (Ozkan et al., 2017).

Although IC is classified differently by many researchers, IC is mainly the combination of human capital (HC), structural capital (SC) and relational capital (RC) (Stewart, 1997; Sveiby, 1997). Employees' education, proficiency, knowledge, intelligence and skills are the component of HC (Shahzad et al., 2023). SC denotes the internal capabilities of an organization which involves the corporate systems, procedures, innovation and structures (Vo & Tran, 2021). RC represents the collective value and insights gained through a company's external relationships, which are crucial for its strategic positioning and competitive advantage (Xu & Li, 2022). The measurement of IC has many methods and value added intellectual capital (VAIC) is extensively used in academia which measures the firm efficiency combining capital employed efficiency (CEE), HC efficiency (HCE) and SC efficiency (SCE) (Xu & Li, 2022). Thus, VAIC takes input from physical capital, HC and SC.

3.2. Intellectual Capital and Firm Performance

Sustainable firm performance is dependent on intangible assets or IC and more importantly, modern economy keeps aside the physical assets for their competitive advantage (Mondal & Ghosh, 2012). IC influences the firm performance positively and creates firm value in long term. Smriti and Das (2018) showed a positive association between VAIC and firm performance of India. They added that HC has more impact on firm productivity while SCE and CEE both act as an equal contributor for growth in sales and market value. Mondal and Ghosh (2012) claimed relationship between the elements of VAIC and performance was changing over the time and SCE was less important for banks' profitability than HCE. Vo and Tran (2021) stated that IC increased the wealth of banking sector in Vietnam over the time. They added HCE and CEE both have the positive and significant impact on profitability while the effect of SCE is undetermined with the performance level of bank. As a mean of increasing the future value of a firm, three components of IC namely HC, SC and RC are directly associated with the innovation quality and speed of firm and consequently increases the financial and operational efficiency of that firm (Wang et al., 2021). Even, the corporate performance, knowledge management and core capabilities of small and medium enterprises (SME's) are influenced by IC (Demartini & Beretta, 2020). However, in 2020, Ting *et al.* (2020) found a negative impact of CEE with the profitability of a firm. Authors added that HCE and changes in level of IC efficiency positively affected the firm sales growth and efficacy. Consistency in all measurement method of IC is not found over the year. Soewarno and Tjahjadi (2020) felt there is a need for improvement in the measurement of IC. They found positive impact of IC on firms' profitability using VAIC and adjusted VAIC but not all elements in two methods are equally related with the performance of firm. Moreover, VAIC is positively influenced the profitability of firm but in element wise discussion, only HCE has an positive impact on performance not the CEE and SCE (Shah et al., 2024). However, Bala *et al.* (2024) claimed no significant relationship with the modified VAIC and firm profitability. Based on the above argument, following hypothesis is formed.

H_{1a}: MVAIC has a positive association with firm performance.

H_{1b}: CEE has a positive association with firm performance.

H_{1c}: HCE has a positive association with firm performance.

H_{1d}: SCE has a positive association with firm performance.

H_{1e}: RCE has a positive association with firm performance.

3.3. Moderating Effect of Board Characteristics

The main responsibility of the board of directors (BOD) is to oversee the management, keeping them focused and accountable to the stakeholders (Kamath, 2019). Activities of BOD has a direct impact on the management of IC and the high quality of BOD enhances the efficiency of IC in a firm (Rositha et al., 2019). Rositha *et al.* (2019) found a positive relationship between the board characteristics (namely size of the board, board independence, board gender diversity and frequency of board meeting) and IC. Kamath, (2019) explained a significant association between the board characteristics and IC efficiency. Author added board size and frequency of meeting has a negative relationship with IC while independence of has a positive impact on IC. However, Al-Musalli and Ismail (2012) stated a insignificant association between board size and IC while, board independence showed a significant association. Frequncy of board meeting and independence has a positive influence on IC disclosure ensure the effectiveness of corporate governance of a firm (Mubaraq & Ahmed Haji, 2014) and authors showed a positive association among them.

IC efficiency is lower in family firm (FFs) than non family firm (NFFs) and the relationship between the board characteristics (namely board size, board indepence and board gender diversity) and IC performance is opposite in FFs and NFFs firms (Scafarto et al., 2021). Moreover, Ebrahim *et al.* (2021) showed a significant association between the size of board and IC performance and they added board independence and size of the board are significantly correlated with IC efficiency. However, Adebayo *et al.* (2021) claimed that board characteristics and IC are negatively related and they took board size, board independence, and frequency of board meeting as board characteristics attributes. Smilarly Farooq and Ahmad (2023) claimed a negative relationship of IC performance with board independence and board gender diversity.

Effective board characteristics may helpful to increase the operational and financial efficiency of a firm. However, previous study showed positive and negative association between board characteristics and firm performance. Board size is the most significant for facilitating the firm performance as opinions, wisdom and versitality of larger board is positively impact on firm performance (Shah et al., 2024). Among the different board charectaristics, board independence is positively (Okon Akpan, 2014) and board gender diversity is negatively related with the firm performance (Farooq & Ahmad, 2023). Okon Akpan (2014) also found a negative relationship between board gender diversity and firm performance. Author added that inclusion of female in the board is a window dressing as their percentage in number is very low. Pavić Kramarić *et al.* (2018) claimed that board size and board gender diversity are inversely related with the firm performance. However, Kanakriyah (2021) showed a direct association between board characteristics (board size, board independence, board gender diversity and board performance) and corporate performance.

Based on the above discussion, following hypotheses are formulated.
H_2: Board characteristics modarates the relationship between IC and firm performance.
H_{2a} : Board size modarates the relationship between IC and firm performance.
H_{2b}: Board independence modarates the relationship between IC and firm performance.
H_{2c}: Board gender diversity modarates the relationship between IC and firm performance.
H_{2d}: Board performance modarates the relationship between IC and firm performance.

4. RESEARCH DESIGN

4.1. Sample and Data

For the purpose of the study, top 100 firms listed in Dhaka Stock Exchange (DSE) have been selected. From the 217 manufacturing companies listed on the DSE, firms were chosen based on their market capitalization, representing more than two-thirds of the total market value of the manufacturing sector on the DSE. The samples have been taken for the years 2018-2023 resulting in an initial sample size of 600 firm-years. However, due to the unavailability of some data, the final sample size has been narrowed down to 588 firm-years. The selection of 2018 as the starting year is justified by the introduction of the revised Corporate Governance Code during that period. Data for the study were manually extracted from companies' annual reports. Financial institutions were excluded due to their distinct governance frameworks and regulatory compliance requirements. Table 1 presents the distribution of the sample across industries, indicating that the engineering sector comprises the largest portion (20%), followed by the textile sector (17%).

Table 1: Sample Design by Industry

Industry	Sample Firms	% of Total Sample
Cement	6	6%
Ceramics	5	5%
Engineering	20	20%
Food & Allied	11	11%
Fuel & Power	10	10%
Paper & Printing	3	3%
Pharmaceuticals & Chemicals	16	16%
Tannery	4	4%
Textile	17	17%
Miscellaneous	8	8%
Total	100	100%

4.2. Definition of Variables

Dependent Variable- The dependent variable of the study, firm performance, is measured using both accounting-based and market-based indicators to ensure robustness and comprehensiveness. Return on Assets (ROA) is used as the primary accounting-based measure which is calculated as the ratio of profit before tax to total assets. This metric captures the internal operational efficiency of a firm in generating earnings from its asset base. Tobin's Q (TQ), on the other hand, represents the market-based measure of performance and is computed as the sum of the market value of equity and the book value of debt divided by total assets. This ratio reflects investor perceptions of a firm's future growth potential relative to its assets.

Independent Variable- The study employs the MVAIC model to quantify a firm's intellectual capital efficiency. The construction of MVAIC follows a structured three-step approach. In the first step, Value Added (VA) is calculated as the difference between a firm's total revenue (OUT) and its total operating expenses (IN), which include employee-related expenditures. This is expressed as:

$$VA = OUT - IN \quad (1)$$

In the second step, the Intellectual Capital Efficiency (ICE) is determined by aggregating three components: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Relational Capital Efficiency (RCE). Specifically, HCE captures the value generated per unit of investment in human resources and is calculated as VA divided by total employee compensation (HC). SCE reflects the proportion of value added attributable to structural capital, measured as the difference between VA and HC divided by VA. RCE assesses the value created per unit of investment in external relational capital, proxied by marketing, selling, and advertising expenses (RC). The component formulas are as follows:

$$HCE = VA / HC \quad (2)$$

$$SCE = (VA - HC) / VA \quad (3)$$

$$RCE = RC / VA \quad (4)$$

Thus, ICE is defined as the sum of these three components:

$$ICE = HCE + SCE + RCE \quad (5)$$

In the final step, Capital Employed Efficiency (CEE) is computed to capture the efficiency of physical and financial capital. CEE is measured by dividing VA by capital employed (CE), where CE represents the difference between total assets and total equity:

$$CEE = VA / CE \quad (6)$$

Combining the ICE and CEE components yields the final MVAIC measure, which represents the overall efficiency of value creation through both intellectual and physical capital. Formally, it is expressed as:

$$MVAIC = HCE + SCE + RCE + CEE \quad (7)$$

A higher MVAIC value indicates greater effectiveness in utilizing intellectual and physical resources to generate corporate value, thereby reflecting superior organizational efficiency in managing intangible assets.

Moderating Variables- To explore the moderating effect of board, four board-related characteristics are incorporated into the analysis as moderating variables. Board Size (BSIZE) is measured as the total number of board members, based on the

notion that larger boards may provide broader expertise and better oversight. Board Independence (BIND) is defined as the proportion of independent directors to the total number of board members, reflecting the board's ability to monitor management objectively. Board Gender Diversity (BGD), representing diversity and inclusiveness in board composition, is measured as the ratio of female directors to total board members. Board Performance (BPERFORM), proxied by the frequency of board meetings held during the year, serves as an indicator of board diligence and engagement in the strategic affairs of the firm.

Control Variables- In addition to the key variables, a number of control variables are included to account for firm-specific and governance-related factors that may influence performance outcomes. Audit Committee Size (ACSIZE) is measured by the number of members in the audit committee, which is expected to strengthen financial oversight. Audit Quality (BIG4) is represented as a dummy variable, coded 1 if the firm is audited by one of the Big Four audit firms, and 0 otherwise, reflecting the credibility and reliability of financial reporting. Leverage (LEV), calculated as the ratio of total liabilities to total assets, captures the firm's financial risk, while Liquidity (LIQ), defined as the ratio of current assets to current liabilities, reflects short-term financial solvency. Firm Size (FSIZE), measured as the natural logarithm of total assets, serves as a proxy for the firm's scale and resource capacity. Finally, Firm Age (FAGE) is calculated as the natural logarithm of the number of years since the firm's establishment, indicating the maturity and experience level of the organization. Table 2 shows the definition of variables used in the study.

Table 2: Definition of Variables

Variable Name	Symbol	Measurement	References
Panel A: Dependent Variable			
Return on Asset	ROA	Ratio of Profit Before Tax to Total Assets	(Nadeem *et al.*, 2017; Smriti and Das, 2018; Xu and Liu, 2020)
Tobin's Q	TQ	(Market Value of Equity + Book Value of Debt) / Total Assets	(Sobhan *et al.*, 2025; Wu and Li, 2023)
Panel B: Independent Variable			
Modified Value-Added Intellectual Capital	MVAIC	CEE + HCE + SCE + RCE	(Faruq *et al.*, 2023; Ulum *et al.*, 2014; Vishnu and Gupta, 2014; Xu and Liu, 2020)
Capital Employed Efficiency	CEE	VA / CE, where CE is the difference between total asset and total equity	
Human capital efficiency	HCE	VA / HC, where HC is total salaries and wages of employees	
Structural capital efficiency	SCE	(VA - HC) /VA	
Relational capital efficiency	RCE	RC / VA, where RC is total marketing, selling and advertising expense	
Panel C: Moderating Variables			
Board size	SIZE	Number of Members in a Board	(Farooq and Ahmad, 2023; Kamath, 2019; Rositha *et al.*, 2019)
Board independence	IND	Ratio of Independent Directors to Board Size	(Farooq and Ahmad, 2023; Kamath, 2019; Rositha *et al.*, 2019)
Gender diversity	GD	Ratio of Female Directors to Board Size	(Farooq and Ahmad, 2023; Kamath, 2019; Rositha *et al.*, 2019)
Board performance	BPER	Number of Board Meetings Held During a Year	(Mubaraq and Ahmed Haji, 2014)
Panel D: Control Variables			
Audit Committee Size	ACSIZE	Number of Members in an Audit Committee	(Li *et al.*, 2012)
Audit Quality	BIG4	A Dummy Variable with an Assigned Value of 1 if a Big 4 Audit Firm audits the Client; otherwise, 0.	(Li *et al.*, 2012)
Leverage	LEV	Ratio of Total Liabilities to Total Assets	(Vo and Tran, 2021; Xu and Liu, 2020)

Liquidity	LIQ	Ratio of Current Assets to Current Liabilities	(Chatterjee *et al.*, 2022; Whiting and Woodcock, 2011)
Firm size	FSIZE	Natural logarithm of total assets	(Vo and Tran, 2021; Xu and Liu, 2020)
Firm Age	FAGE	Natural Logarithm of Number of Years Elapsed since Establishment	(Chatterjee *et al.*, 2022; Whiting and Woodcock, 2011)

4.3. Research Model

To investigate the moderating effect of board characteristics on association between IC and firm performance, the following regression models have been developed:

$$ROA_{it} = \beta_0 + \beta_1 MVAIC_{it} + \beta_2 BSIZE_{it} + \beta_3 MVAIC_{it} \times BSIZE_{it} + \beta_4 BIND_{it} + \beta_5 MVAIC_{it} \times BIND_{it} + \beta_6 BGD_{it} + \beta_7 MVAIC_{it} \times BGD_{it} + \beta_8 BPERFORM_{it} + \beta_9 MVAIC_{it} \times BPERFORM_{it} + \beta_{10} ACSIZE_{it} + \beta_{11} BIG4_{it} + \beta_{12} LEV_{it} + \beta_{13} LIQ_{it} + \beta_{14} FSIZE_{it} + \beta_{15} FAGE_{it} + \varepsilon_{it} \quad (8)$$

$$TQ_{it} = \beta_0 + \beta_1 MVAIC_{it} + \beta_2 BSIZE_{it} + \beta_3 MVAIC_{it} \times BSIZE_{it} + \beta_4 BIND_{it} + \beta_5 MVAIC_{it} \times BIND_{it} + \beta_6 BGD_{it} + \beta_7 MVAIC_{it} \times BGD_{it} + \beta_8 BPERFORM_{it} + \beta_9 MVAIC_{it} \times BPERFORM_{it} + \beta_{10} ACSIZE_{it} + \beta_{11} BIG4_{it} + \beta_{12} LEV_{it} + \beta_{13} LIQ_{it} + \beta_{14} FSIZE_{it} + \beta_{15} FAGE_{it} + \varepsilon_{it} \quad (9)$$

5. FINDINGS AND DISCUSSION

5.1. Descriptive Statistics

Table 3 presents the descriptive statistics for the variables used in the study, based on a sample of 588 observations. The dependent variables include ROA with a mean of 0.04 and a standard deviation of 0.08, ranging from -0.29 to 0.53, indicating variability in firm profitability. TQ has a mean of 11.82 and a standard deviation of 18.83, with a range from 0.31 to 131.09, reflecting diverse market valuations. The independent variable, MVAIC, has a mean of 269.59 and a standard deviation of 49.65, ranging from -105.82 to 487.42, suggesting significant variation in IC efficiency. Moderating variables include BSIZE with a mean of 7.62 members, BIND with a mean ratio of 0.26, BGD with a mean ratio of 0.17, and BPERFORM with a mean of 8.40 meetings per year. Control variables include ACSIZE with a mean of 3.81 members, BIG4 with 30% of firms audited by Big 4 firms, LEV with a mean of 0.49, LIQ with a mean of 3.45, FSIZE with a mean of 119.41 million USD, and FAGE with a mean of almost 36 years.

Table 3: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
ROA	588	0.04	0.08	-0.29	0.53
TQ	588	11.82	18.83	0.31	131.09
MVAIC	588	269.59	49.65	-105.82	487.42
BSIZE	588	7.62	2.42	5.00	18.00
BIND	588	0.26	0.09	0.20	0.67
BGD	588	0.17	0.15	0.00	0.60
BPERFORM	588	8.40	4.85	2.00	41.00
ACSIZE	588	3.81	0.78	3.00	7.00
BIG4	588	0.30	0.46	0.00	1.00
LEV	588	0.49	0.23	0.01	1.00
LIQ	588	3.45	13.99	0.06	319.55
FSIZE (in million USD)	588	119.41	341.60	1.06	4459.84
FAGE	588	35.31633	17.00642	12	114

5.2. Bivariate Analysis

Table 4 presents the Pearson correlation coefficients among the study's variables. The dependent variables, ROA and TQ, show a significant positive correlation (0.206), suggesting that higher profitability is associated with higher market valuations. MVAIC is positively correlated with ROA (0.156) but not significantly with TQ, indicating a stronger relationship with accounting-based performance. BSIZE is significantly correlated with ROA (0.087), TQ (0.174), and BIND (0.232), suggesting larger boards may influence performance and governance structures. BIND shows no significant correlation with ROA or TQ but is positively correlated with ACSIZE (0.093). BGD is negatively correlated with BSIZE (-0.110) and LEV (-0.105). BPERFORM is positively correlated with TQ (0.108) and LEV (0.151). Since none of the correlation coefficients exceed the threshold of 0.80, there is no evidence of severe multicollinearity among the independent variables (Gujarati, 2003). Additionally, the average Variance Inflation Factor (VIF) was found to be 1.89 (not tabulated), which is well below the commonly accepted cut-off value of 10 (Wooldridge, 2016), further confirming that multicollinearity is not a concern in this study.

Table 4: Pearson Correlation Matrix

	roa	tq	mvaic	bsize	bind	bgd	bperform	acsize	big4	lev	liq	fsize	fage
roa	1												
tq	0.206**	1											
mvaic	0.156**	0.016	1										
bsize	0.087*	0.174**	-0.004	1									
bind	0.011	0.050	-0.029	0.232**	1								
bgd	-0.035	0.024	0.080	-0.110**	-0.055	1							
bperform	0.044	0.108**	0.037	0.156**	0.003	-0.070	1						
acsize	0.245**	0.230**	0.046	0.137**	0.093**	-0.228**	0.037	1					
big4	0.205**	0.213**	0.145**	0.206**	0.115*	-0.059	0.009	0.125**	1				
lev	-0.150**	-0.075	-0.063	0.020	0.043	-0.105*	0.151**	-0.021	-0.245*	1			
liq	-0.033	-0.013	0.002	-0.043	0.079	-0.041	0.043	0.011	-0.065	-0.171**	1		
fsize	0.112**	0.408**	0.031	0.021	0.046	-0.120**	0.321**	-0.093*	0.030	0.168**	-0.005	1	
fage	0.076	0.143**	0.213**	0.185**	-0.148**	0.117**	0.055	-0.013	0.225**	0.217**	-0.103*	0.091*	1

*p < 0.05; **p < 0.01

5.3. Multivariate Analysis

Table 5 presents the results of the random effects regression models examining the association between IC, as measured by MVAIC, and firm performance, proxied by ROA in Model 1 and TQ in Model 2. The appropriateness of the random effects model was confirmed based on the results of the Hausman specification test.

In Model 1 (ROA), MVAIC exhibits a significant positive association with firm performance (coefficient = 2.1602, p < 0.01), indicating that higher IC enhances profitability. The interaction terms MVAIC × BSIZE (coefficient = 0.7647, p < 0.05) and MVAIC × BIND (coefficient = 0.9351, p < 0.01) are statistically significant, suggesting that larger board sizes and higher board independence amplify the positive effect of IC on ROA. Similarly, the interaction term MVAIC × BPERFORM (coefficient = 1.0942, p < 0.01) indicates that more frequent board meetings strengthen this relationship. In Model 2 (TQ), MVAIC is also positively associated with firm performance (coefficient = 3.5031, p < 0.01). The interaction terms MVAIC × BSIZE (coefficient = 0.8668, p < 0.01) and MVAIC × BIND (coefficient = 1.2228, p < 0.01) remain significant, reinforcing the moderating role of board size and independence. The interaction term MVAIC × BPERFORM (coefficient = 1.9351, p < 0.05) further underscores the positive moderating effect of board performance. However, board gender diversity did not exhibit a statistically significant moderating effect on the relationship between IC and firm performance.

Among the control variables, FSIZE and BIG4 show significant and positive effects on firm performance (Li et al., 2012; Vo & Tran, 2021; Xu & Liu, 2020), while LEV is negatively associated with both ROA and TQ (Vo & Tran, 2021). The overall explanatory power of the models is satisfactory, with R-squared values of 0.2728 for ROA and 0.4456 for TQ.

Table 5: Regression Result Using Random Effects Model

Variable	Model 1 (ROA)		Model 2 (TQ)	
	Coeff.	SE	Coeff.	SE
MVAIC	2.1602***	(0.2501)	3.5031***	(0.5093)
BSIZE	-0.1013	(0.8013)	0.1306	(0.1120)
MVAIC × BSIZE	0.7647**	(0.1046)	0.8668***	(0.8758)
BIND	-0.2117	(0.5263)	-0.5043	(1.1623)
MVAIC × BIND	0.9351***	(0.1702)	1.2228***	(0.9175)
BGD	-0.0190	(0.6220)	-0.2536	(1.0092)
MVAIC × BGD	0.0201	(0.7803)	0.0082	(0.8158)
BPERFORM	0.6017*	(0.6006)	0.7167	(0.0563)
MVAIC × BPERFORM	1.0942***	(0.4175)	1.9351**	(0.2006)
ACSIZE	0.2087*	(0.3038)	0.9696	(0.4142)
BIG4	0.0174**	(0.8065)	0.8107***	(0.6778)
LEV	-0.0723***	(0.2114)	-0.1641***	(1.0274)
LIQ	0.0019	(0.9659)	0.1002	(0.0811)

FSIZE	0.4063***	(0.6417)	2.4254***	(0.2795)
FAGE	0.0186	(0.8141)	1.3615*	(1.5158)
CONSTANT	0.1770	(0.9605)	9.3150	(5.9848)
Observations	588		588	
R-squared	0.2728		0.4456	
Wald chi^2	42.08***		31.10***	

*p < 0.10; **p < 0.05; ***p < 0.01

5.4 Robustness Test

To ensure the robustness of the baseline results, Table 6 employs alternative performance measures namely earnings per share (EPS) and price-earnings ratio (PE) as dependent variables. The coefficient of MVAIC remains positive and statistically significant across both models (β = 0.8803, p < 0.05 for EPS; β = 0.7440, p < 0.01 for PE) and thus, reaffirms the robustness of the IC–performance relationship. Consistent with prior findings, board size positively moderates this relationship. Similarly, the interactions between MVAIC and board independence are significant at the 1% level in both models. While board gender diversity remains insignificant, board performance exhibits a marginally significant moderating effect in the EPS model and a statistically significant effect in the PE model. These findings further validate the role of IC and board mechanisms in shaping financial outcomes.

Table 6: Robustness Test

Variable	Model 3 (EPS)		Model 4 (PE)	
	Coeff.	SE	Coeff.	SE
MVAIC	0.8803**	(0.2139)	0.7440***	(0.8910)
BSIZE	-0.1167	(0.4658)	-1.3753	(2.1944)
MVAIC × BSIZE	0.4013***	(0.5011)	1.6034**	(0.3154)
BIND	0.7197	(1.2892)	-0.3851	(2.3435)
MVAIC × BIND	0.9118***	(0.4269)	2.1143**	(0.4024)
BGD	-0.1548	(2.9081)	1.3343	(0.9762)
MVAIC × BGD	0.0030	(0.2238)	0.1052	(0.3247)
BPERFORM	-0.1332	(0.8823)	0.6716	(1.0404)
MVAIC × BPERFORM	0.4708*	(0.6489)	0.8831**	(0.0128)
ACSIZE	1.2899*	(0.5492)	1.0427	(1.6564)
BIG4	1.3647**	(0.9181)	1.4089***	(0.6489)
LEV	-1.3525**	(1.5017)	-2.5284*	(1.8734)
LIQ	-0.1660	(0.1197)	-1.7459*	(1.5943)
FSIZE	0.2308***	(0.3150)	2.8919***	(1.7015)
FAGE	2.5622	(1.7768)	1.5509	(1.6697)
CONSTANT	6.2896	(9.8162)	5.2280	(1.4058)
Observations	588		588	
R-squared	0.3821		0.2942	
Wald chi^2	23.96***		28.27***	

*p < 0.10; **p < 0.05; ***p < 0.01

5.5. Component-Wise Regression Analysis

Table 7 disaggregates MVAIC into its individual components namely HCE, SCE, RCE and CEE to explore their distinct impacts on firm performance. The results indicate that HCE and SCE are significantly and positively associated with both ROA and TQ which suggests that investments in employees and internal structures are critical drivers of value in emerging market firms. While RCE is not significant in the ROA model, it becomes positively significant in the TQ model, indicating a market-based recognition of external relational efforts. CEE also exhibits positive and statistically significant effects across both models which signifies the efficient use of capital resources as a determinant of firm success. Among the controls, firm size remains

consistently significant and positive, and audit quality exerts a favorable influence on market-based performance. Leverage continues to have a negative association with both performance measures.

Table 7: Component-wise Regression Results

Variable	Model 5 (ROA)		Model 6 (TQ)	
	Coeff.	SE	Coeff.	SE
HCE	0.4521***	(0.4261)	0.4041***	(0.2027)
SCE	0.7882**	(0.3436)	0.3368***	(0.6092)
RCE	0.3268	(0.7242)	1.0886*	(0.9933)
CCE	0.2110***	(0.2024)	0.4114**	(0.2217)
ACSIZE	0.1087*	(0.4736)	1.0752**	(0.4017)
BIG4	0.0153**	(0.7263)	0.8513*	(0.6754)
LEV	-0.1057***	(0.2132)	-0.9752***	(1.2343)
LIQ	0.5020	(0.8409)	0.1002	(0.0795)
FSIZE	0.9241***	(0.1220)	1.6456***	(0.2904)
FAGE	0.0205	(0.9197)	0.5689*	(0.4739)
CONSTANT	0.4333	(0.7618)	3.3459	(1.4616)
Observations	588		588	
R-squared	0.339		0.4443	
Wald chi^2	17.87***		29.22***	

*p < 0.10; **p < 0.05; ***p < 0.01

6. DISCUSSION

Based on the RBV, this study investigates the association between IC and firm performance, and examines how board characteristics moderate this relationship in the context of an emerging economy, Bangladesh. The findings provide strong support for the central proposition that IC serves as a critical intangible asset contributing to superior firm performance (Mondal & Ghosh, 2012; Smriti & Das, 2018; Vo & Tran, 2021).

The results from the random effects regression model demonstrate that MVAIC is positively and significantly associated with both accounting-based (ROA) and market-based (Tobin's Q) performance indicators. This supports Hypothesis H1a and aligns with the theoretical predictions of the RBV, affirming the strategic value of IC in enhancing firms' competitive positioning and financial outcomes (Ozkan et al., 2017; Xu & Liu, 2020). The robustness of this finding is further reinforced through alternative performance measures such as EPS and PE ratio which also exhibit significant positive relationships with MVAIC.

When disaggregating MVAIC into its core components, the study finds that HCE, SCE, and CEE are all significantly and positively related to firm performance, thus confirming Hypotheses H1b, H1c, and H1d. These results emphasize the multi-dimensional nature of IC and suggest that organizations benefit not only from the knowledge and skills of their employees (HCE) but also from the effectiveness of their internal systems (SCE) and the efficient utilization of physical and financial resources (CEE) (Shah et al., 2024; Ting et al., 2020; Wang et al., 2021). Although Relational Capital Efficiency (RCE) does not show a significant impact on accounting-based performance, its positive association with market-based measures suggests that investors and external stakeholders place value on firms' relationships and external engagement, thus partially supporting Hypothesis H1e.

Consistent with the second hypothesis, the results reveal that board characteristics significantly moderate the relationship between IC and firm performance. Specifically, the interaction terms between MVAIC and board size, board independence, and board performance are all positive and statistically significant. These findings suggest that effective governance mechanisms enhance the firm's ability to leverage its IC for performance gains (Kamath, 2019; Rositha et al., 2019). Larger boards may bring diverse expertise and oversight capabilities that strengthen the strategic deployment of IC. Similarly, independent directors may offer critical judgment and monitoring functions, ensuring that IC resources are managed efficiently and strategically (Al-Musalli & Ismail, 2012). The frequency of board meetings, as a proxy for board diligence and engagement, also strengthens the positive IC–performance link, supporting the view that more active boards contribute to better strategic alignment and decision-making regarding intangible assets (Mubaraq & Ahmed Haji, 2014).

Interestingly, the moderating effect of board gender diversity was not statistically significant in any of the models. This finding, which fails to support Hypothesis H2c, is in line with prior studies suggesting that gender diversity in many emerging market contexts may be symbolic or constrained by tokenism (Farooq & Ahmad, 2023; Okon Akpan, 2014). In Bangladesh, the low representation of women on boards may limit their ability to influence strategic outcomes such as IC utilization. While diversity remains an important goal for inclusive governance, its effectiveness as a moderating mechanism may depend on the depth of integration and participation of female directors in decision-making processes.

7. CONCLUSION

This study explores the relationship between intellectual capital (IC) and firm performance in the context of an emerging economy, with a particular focus on the moderating role of board characteristics. Grounded in the Resource-Based View (RBV), the study argues that IC, as a strategic intangible asset, contributes to sustained competitive advantage and superior performance of firms when effectively managed and supported by sound corporate governance mechanisms.

The empirical results, derived from a panel dataset of listed non-financial firms indicate a positive and significant association between IC and firm performance. Component-wise analysis reveals that human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE) all significantly enhance both accounting- and market-based performance, while relational capital efficiency (RCE) exhibits a limited effect. Furthermore, board characteristics namely board size, board independence, and board performance, positively moderate the IC–performance relationship. This highlights the role of governance structures in enhancing the effectiveness of IC deployment. However, no significant moderating effect is found for board gender diversity.

Theoretically, this study contributes to the IC and corporate governance literature by integrating the RBV framework into an emerging market context. It advances understanding of how intangible assets interact with internal governance mechanisms to influence firm outcomes. The findings emphasize the importance of viewing IC not as a stand-alone asset, but as a resource whose value is contingent on effective strategic and oversight mechanisms.

From a practical standpoint, the study offers valuable insights for a range of stakeholders. For corporate managers, the findings emphasize the importance of developing and managing IC particularly through investments in employee skills, innovation infrastructure, and efficient resource utilization, as a strategic priority to drive both financial and market performance. Firms are encouraged to embed IC considerations into strategic planning and performance evaluation frameworks. For corporate boards, the study highlights the need to play a more proactive role in overseeing IC development and alignment with organizational goals. Enhancing board independence, maintaining an optimal board size, and ensuring frequent, meaningful board engagements can strengthen IC-related decision-making and accountability. The insignificant moderating effect of board gender diversity suggests a need for policies to enhance the substantive participation of female directors, potentially through training or regulatory mandates

For policymakers and regulators, the results suggest the need for capacity-building initiatives that support firms in effectively measuring, reporting, and leveraging IC. Encouraging transparent IC disclosure and promoting board diversity, independence, and competence through governance reforms may strengthen overall firm competitiveness and investor confidence, particularly in emerging economies. Moreover, the findings are also relevant for investors and analysts who assess firm value and risk. Given the observed impact of IC on firm performance, especially when supported by robust governance, IC indicators could be incorporated into valuation models and investment screening processes.

Despite these contributions, the study is not without limitations. First, the use of MVAIC as a proxy for IC, while widely adopted, may not fully capture the complexity of intellectual resources, particularly in relation to innovation, knowledge processes, and dynamic capabilities. Second, the study relies on secondary data from a single country, which may limit the generalizability of the findings. Third, the analysis does not differentiate between industry sectors, which may exhibit varying levels of IC utilization and governance maturity.

Future research may address these limitations by exploring alternative measures of IC, such as green IC or innovation-based proxies. Longitudinal or qualitative studies may provide deeper insights into the dynamic processes through which IC is developed and leveraged over time. Additionally, comparative studies across countries or industry sectors could enrich understanding of the contextual factors that influence the IC–performance nexus.

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