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The Effects of Financial Institutions' Credit Allocation on the Economic Growth in Cambodia: A By-Industry Analysis

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ABSTRACT

This study applies quantitative analysis to examine credit disbursement by financial institutions across industries in Cambodia, using official economic growth data. Results show that total credits from banks (TCID_Bs) and microfinance institutions (TCID_MFIs) are strong predictors of growth, where a 1% increase in TCID_Bs and TCID_MFIs corresponds to 0.3595% and 0.3136% rises in Cambodian GDP (NGDPD), respectively. Sectoral analysis highlights differing effects: for banks, a 1% increase in credits to Real Estate raises NGDPD by 0.34%, credits to Agriculture, Forestry and Fishing and Other Lending by 0.12% each, Information Media and Telecommunications by 0.04%, and Rental and Operational Leasing by 0.036%, while credits to Hotels and Restaurants, Utilities, and Mining and Quarrying reduce NGDPD by 0.32%, 0.11%, and 0.05%. For MFIs, credits to Household and Trade and Commerce raise NGDPD by 0.26% and 0.23%, while credits to the Agricultural sector reduce it by 0.45%. These findings show that while most sectoral lending supports economic growth, some industries negatively affect it, emphasizing the need for targeted credit allocation to foster sustainable and inclusive economic development.

Keywords: *Credit Allocation, Economic Growth, Gross Domestic Product, Financial Institutions, Credits, Classified Industries*

1. Introduction

Background of the Study

Cambodia has enjoyed high economic growth for a few decades, with an annual real Gross Domestic Product (GDP) growth rate of 6-7 percent. Cambodia's economic landscape has

undergone a remarkable transformation in recent decades. Between 2009 and 2023, the country experienced significant growth, driven by factors such as tourism, garment exports, and a thriving construction sector (World Bank, 2023). However, a critical yet under-examined aspect of this growth story is the role of financial institutions' credit.

This study delves into the intricate relationship between financial credits provided by banks and microfinance institutions and economic growth in Cambodia from 2009 to 2023. A by-industry analysis was conducted to explore how credit allocation has impacted the performance of various sectors within the Cambodian economy.

The study examines the impact of financial development, defined as an increase in the money supply or the supply of credit from financial institutions in a country, on economic growth in Cambodia, with a particular focus on the interactions between the financial industry and the various sectors of the economy. The study is essential for several reasons. First, like most developing countries, Cambodia has been trying to rejuvenate its economy, which has been stagnant for decades due to wars and internal conflicts. It has been extensively argued that it is essential for developing countries to set the economy on a path of sustained economic growth as a prerequisite for solving economic problems, such as poverty, unemployment, and low literacy rates, to lessen the gap between rich and poor countries. Studying the linkage between financial development and economic growth is the first step in understanding the forces determining economic growth and identifying the policies essential for moving the economy to a new growth path.

Statement of the Problem

A high and sustainable economic growth rate is the main objective of developing countries, including Cambodia. Many studies have mentioned the contributions of financial credits to economic growth, as in the work of Chanrey et al. (2023), Vathana et al. (2016), and Phon (2022); however, not many assess the impacts of credits in different industries on economic growth. This study measures the contribution by studying the relationship between overall credits and economic growth. Hence, this research aims to assess the impact of credits in different industries on economic growth in Cambodia. As mentioned by Lashkaripour and Lugovskyy (2023), no unique model fits all. Therefore, studying an industry-by-industry basis is essential to determine what pattern each industry holds and its contribution to economic growth.

Cambodia suffered the demise of various industries during and after the civil war, followed by a long civil war during the Khmer Rouge regime in the 1970s. With peace and political stability recently obtained, the industry sector has begun to regain momentum with support from the government and foreign investors. This situation underscores the importance of evaluating the industry sector's contributions to driving economic growth.

Research Objectives

As the financial and economic situation across the globe is highly interrelated, it is clear that a country's economy is significantly affected by the financial institutions operating within it. Financial institutions play a significant role in the development of an economy as they provide credit for other industries to expand. According to Estrada et al. (2010), financial development enhances economic growth by enabling the efficient allocation of credits and reducing the costs of acquiring information. Moreover, there is evidence that the amount of credit to the private sector is closely related to economic growth. This research primarily focuses on examining the impact of credit from financial institutions on other industries within the economy and their contribution to GDP growth.

This study aims to investigate the effects of financial institutions' credits on the economic growth in Cambodia from 2009 to 2023. The specific objectives are as follows:

1. To analyze the significant effect of total credits of banks and MFIs on the economic growth in Cambodia.

2. To analyze the significant effect of total credits of each industry from banks and MFIs on the economic growth in Cambodia.

Research Questions

This study’s primary interest lies in examining how credit from banking and microfinance can impact Cambodia's economic growth from 2009 to 2023. Thus, the overall issues addressed in the study are the effects of bank and MFI credits on Cambodia's economic growth from 2009 to 2023, and how these credits from these funding sources impact the economic growth of each industry in Cambodia.

In order to have a better understanding of the overall effect, an econometric model will be constructed to answer two research questions:

1. Is there a significant effect of total credits of banks and MFIs on economic growth in Cambodia?
2. Is there a significant effect of total credits of each industry from banks and MFIs on the economic growth in Cambodia?

Significance of the Study

Studying the effects of financial institutions' credit allocation on Cambodia's economic growth through a by-industry analysis holds significant value. This approach aligns with established knowledge that assesses how credit fuels business investment and economic activity. Analyzing industry-specific credit dynamics allows for targeted policy interventions to address potential bottlenecks and unlock the growth potential of each industry. This analysis also helps mitigate financial risks by identifying potential overexposure within specific industries. Understanding the industry-specific credit landscape ultimately empowers Cambodia to optimize credit allocation, promote economic diversification, and achieve sustainable economic growth.

2. Literature review

Defining Key Terms

Economic growth refers to the increased production of goods and services within an economy over time. It is typically measured as a country's GDP change over a specific period (Jones, 2002). The Bureau of Economic Analysis (2023) explains that current GDP refers to the monetary value of all final goods and services produced within a country's borders during a specific period. It is the most widely used measure of a nation's economic activity.

Financial institutions are businesses that provide financial services to individuals and businesses (American Bankers Association, 2023). These services include accepting deposits, lending money, processing payments, investing funds, and providing financial advice. According to the National Bank of Cambodia ([NBC], 2023), there are 154 financial institutions in Cambodia, where there are 58 commercial banks, nine specialized banks, five microfinance deposit-taking institutions, and 82 non-deposit-taking microfinance institutions.

Credits in a financial context refer to any form of financial accommodation provided by a lender to a borrower, including loans disbursed by banks and MFIs (Investopedia, 2023). The

World Bank (2023) defines banks' credits as loans provided by banks to an individual or business. Bank loans involve the transfer of funds from the bank (the lender) to the borrower, with the agreement to repay the principal amount, usually with interest, over a specified period.

According to NBC (2023), the total credits of banks classified by different industries are from all 67 banks in Cambodia, which include 58 commercial banks and nine specialized banks. Those industries are: Agriculture, Forestry and Fishing (Bs_AFF), Credit Cards (Bs_CCL), Construction (Bs_CST), Financial Institutions (Bs_FIS), Hotels and Restaurants (Bs_H&R), Information Media and Telecommunications (Bs_IMT), Mining and Quarrying (Bs_M&Q), Manufacturing (Bs_MFT), Mortgages, Owner-Occupied Housing only (Bs_MHG), Personal Lending (Bs_PLG), Real Estate Activities (Bs_REA), Rental and Operational Leasing Activities (Bs_ROL), Retail Trade (Bs_RTT), Transport and Storage (Bs_T&S), Utilities (Bs_UTL), Wholesale Trade (Bs_WST), Other Non-Financial Services (Bs_NFS), and Other Lending (Bs_OLG).

MFIs' credits are small loans provided by MFIs to low-income individuals or groups, primarily to foster self-employment and income generation (World Bank, 2023). According to NBC (2023), the total credits of MFIs classified by industries are collected from all 87 MFIs, which include four microfinance deposit-taking institutions and 83 non-deposit-taking microfinance institutions. Those industries are Agriculture (MFIs_AGR), Construction (MFIs_CST), Financial Institutions (MFIs_FIS), Household (MFIs_HHD), Manufacturing (MFIs_MFT), Services (MFIs_SER), Trade and Commerce (MFIs_T&C), Transportation (MFIs_TST), and Others (MFIs_OLG).

Impacts of Financial Institutions' Credits on Economic Growth

Financial institutions play a crucial role in facilitating economic growth through efficient resource allocation, i.e., credits allow businesses to access funds for investment, leading to increased production, job creation, and overall economic activity (Vathana et al., 2016; Levine et al., 2002); and through reduced information asymmetry, i.e., financial institutions act as intermediaries, mitigating information gaps between lenders and borrowers, leading to more efficient credit allocation (Levine, 1997).

Some studies suggest that bank credit can negatively and positively affect economic growth depending on the region and context (Narayan & Narayan, 2013). Financial sector

development, particularly bank credit, has a complex relationship with economic growth, exhibiting both positive and negative effects, depending on the region and context. It has been found that bank credit negatively impacted economic growth, while financial sector development had a weak influence on growth except in Asia (Narayan & Narayan, 2013).

Bijlsma et al. (2018) indicated a positive but diminishing effect of financial development on economic growth, with a slight increase in economic growth associated with a rise in private sector credit. However, this relationship is subject to publication bias, suggesting an overestimation of the finance-growth effect in past literature. As per the findings of Gregorio and Guidotti (1992), the efficiency of investment, rather than its volume, is the primary channel through which financial development influences long-term growth. They found that, in Latin America, a negative correlation between financial intermediation and economic growth was observed, potentially due to poor regulatory environments. Özatay and Sak (2002) later found a similar result: the financial liberalization in Turkey showed that while the financial system deepened, the impact on credit growth and economic growth was limited, suggesting that other factors, such as increased riskiness, may have played a role.

However, in a study of 10 European countries, bank credits affected economic growth positively, although they did not influence inflation (Korkmaz, 2015). Fisman and Love (2001) also mentioned that in OECD and G20 countries, there is evidence that finance has been crucial for long-term growth. Industries that rely more on trade credit financing grow faster in countries with weaker financial institutions, indicating that trade credit can be an alternative source of funds without developed financial markets. According to Altin and Zeren (2022), for G20 countries, a bidirectional causality relationship between bank credits and economic growth was identified, suggesting that the credit market's orientation and development are significant during economic crises. Benczúr et al. (2019) found that the impact of financial development on economic growth is non-linear and hump-shaped, with different financing sources and recipients influencing growth in varying ways. For high-income countries, bank credit to non-financial corporations positively impacts growth, while household credit has a negative impact after accounting for non-linearities.

Microfinance has been increasingly recognized as a mechanism that can influence economic growth, especially in developing countries. It provides financial services to individuals traditionally excluded from the formal banking sector, aiming to empower them economically and socially. A study by Donou-Adonsou and Sylwester (2017) showed that

MFIs contribute to economic growth by providing loans that are not primarily invested as physical capital but may enhance total factor productivity. Similar work found that microfinance has a positive and statistically significant effect on economic growth through private investment, more so than official development aid, suggesting that resources allocated to microfinance can foster economic development in poorer countries (Lacalle-Calderon et al., 2015).

Another study by Buera et al. (2012) demonstrated that microfinance has a negligible impact on per capita income in the long run but benefits most of the population directly and indirectly, with more substantial welfare gains for the poor and marginal entrepreneurs. Gyimah and Boachie (2018) indicated that microfinance products, including loans, savings, insurance, and education, have been found to positively affect the growth of small businesses, with microloans having the most significant influence.

According to Lopatta and Tchikov (2016), the success and performance of MFIs have a significant impact on economic development by directly influencing economic growth through added purchasing power and indirectly through improvements in capital accumulation and employment rates. Likewise, Suleiman (2014) found that MFIs have a positive impact on SMEs, leading to economic growth through business expansion and employment creation. In addition, Okere et al. (2018) also stated that microfinance activities significantly contribute to economic growth, with total loans and advances of microfinance institutions significantly contributing to growth. Donou-Adonsou and Sylwester (2015) also found that microfinance loan growth has a positive and significant effect on economic growth and total factor productivity in developing countries.

A study by Phon (2022) highlighted the role of microfinance institutions in providing crucial credit access to underserved populations, potentially contributing to poverty reduction and economic growth. Chanrey et al. (2023) confirmed the overall contribution to GDP by credits from both commercial banks and MFIs.

Overall, the effect of financial institutions' credits on economic growth is multifaceted and varies by region, development level, and financial structure. While banks' credits generally support economic growth, the relationship can turn negative when credit expansion is excessive or poorly regulated. Moreover, microfinance has a multifaceted impact on economic growth. It supports economic development by enhancing productivity and private investment. The growth of MFIs also positively affects their loan portfolio quality, and

microfinance products are instrumental in the growth of small businesses. Thus, microfinance has a significant contribution to economic growth, particularly in developing countries. However, the efficiency of investment and the targeted industries for credit allocation also play critical roles in determining the impact on economic growth.

Effects of Credits to Industries on Economic Growth

The National Bank of Cambodia (2020) emphasizes the importance of managing credit risks associated with specific sectors, such as real estate, to ensure financial stability and sustainable growth. Research has suggested that the impact of credit allocation varies across different industries. Concerning this, Vathana et al. (2016) concluded that there is a marginal value of credit to agriculture and industry but found a significant contribution to economic growth, while the credits to service and trade showed slow growth and a lower contribution to employment. A similar study by Joao and Castro (2023) concluded that credit to agriculture and industry has a positive impact on GDP growth and employment in both the short run and long run. Evidence shows that the industries that absorbed the credit are the ones that will contribute to economic growth. Moreover, Levine et al. (2002) found that industry is positively related to economic growth, and the findings on the service sector are less conclusive; while they observe slower growth in credit allocation and employment within services, further research is needed to understand the nuances of this relationship.

According to Joao and Castro (2023), the impact of agricultural credit on agricultural GDP was estimated to be 14.41%. His work found a causal relationship between agricultural credit and agricultural GDP in a unidirectional aspect. These findings suggested that credit-oriented monetary policies can boost economic growth and development in Angola, emphasizing the importance of designing agricultural credit systems that ensure equitable access, fair interest rates, and appropriate risk management mechanisms.

Adebisi (2023) found that bank credit had a significant long-run effect on economic growth, mainly when directed toward sectors like agriculture, manufacturing, and mining. The degree of economic growth affects the relationship between financial sector development and microfinance activity, with the financial sector's development positively influencing the microfinance sector when economic growth is high (Sainz-Fernandez et al., 2018).

Du et al. (2016) found that investments in tourism alone may not be sufficient for economic growth; instead, tourism contributes to growth by integrating into a broader development

strategy that includes standard income determinants. The macroeconomic context influences the performance of MFIs; more robust economic growth and financial depth are associated with better MFI performance, while specific sectors like manufacturing and higher workforce participation may slow MFI outreach growth (Ahlin et al., 2011).

Overall, previous research has suggested that credit from financial institutions will positively impact each industry's economic growth. The impact may differ from one industry to another, depending on the amount of credit absorbed and the period. Therefore, the effect on the economic growth in each industry should be studied separately to give a clearer picture.

Hypotheses

Hypothesis testing typically deals with two main hypotheses: the null hypothesis (H_0) and the alternative hypothesis (H_1) (Field et al., 2012). The null hypothesis in this research study assumes that the independent variables (credits) do not have a statistically significant effect on the dependent variable (economic growth).

Research Question 1: Effect of total credits of banks and MFIs on the economic growth

- H_0: There is no significant difference in the effect of total credits provided by banks and MFIs on Cambodia's economic growth.
- H_1: There is a significant difference in the effect of bank and MFI credits on economic growth.

Research Question 2: Effect of total credits of each industry from the banks and MFIs on the economic growth

- H_0: The total credits provided by banks and MFIs to each industry do not significantly impact Cambodia's economic growth.
- H_1: The total credits provided by banks and MFIs have a significant impact on the economic growth of different industries.

Conceptual Framework

This conceptual framework outlines the key elements and relationships involved in studying the impact of financial institutions' credits on the economic growth in Cambodia, with a

specific focus on analyzing the effects across different industries. The independent variables include: Total credits of banks (TCID_Bs), total credits of MFIs (TCID_MFIs), total credits of banks classified by industries (Bs), and total credits of MFIs classified by industries (MFIs). Where the dependent variable is economic growth, i.e., the GDP of Cambodia (NGDPD). Table 1 shows the conceptual framework guiding the study.

Table 1: Conceptual Framework Guiding the Study

Independent Variables	Relationship	Dependent Variable
Total credits of banks (TCID_Bs)		
Total credits of MFIs (TCID_MFIs)	→	GDP of Cambodia (NGDPD)
Total credits of banks classified by industries (Bs)		
Total credits of MFIs classified by industries (MFIs)		

3. Research Methodology

Research Design

This study adopts a quantitative design utilizing secondary time-series data sourced from the International Monetary Fund (2023) and the National Bank of Cambodia (2023). This method is well-suited for empirically testing hypotheses about associations and causality, such as between NGDPD (gross domestic product of Cambodia) and credit variables, TCID_Bs (total credits of Banks), and TCID_MFIs (total credits of MFIs), as it enables precise numerical measurement and statistical inference. Time-series analysis over the period 2009–2023 allows the researcher to assess dynamic relationships and potential lags between the dependent variable (Cambodia's GDP) and independent variables (credit from banks and MFIs), enhancing the ability to uncover structural patterns and correlation trends. Using

secondary data enhances the efficiency and feasibility of the research, while leveraging established sources, such as the International Monetary Fund and National Bank of Cambodia, ensures data reliability and comparability. Explicitly testing correlations through hypothesis testing of credit's impact on economic growth aligns with standard econometric practice in macroeconomic research, allowing the investigation of differential effects from banks versus MFIs and industry-specific credit contributions.

Types and Sources of Data

The macroeconomic data, such as NGDPD (gross domestic product of Cambodia, current prices in USD billion, from 2009 to 2023) and GDP growth rate for the period of 2009 to 2023, were extracted from the International Monetary Fund (2023), as shown in Table 2.

Table 2: Macroeconomic Data

Variables	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NGDP %	0.09	5.96	7.07	7.31	7.36	7.14	7.04	6.86	7.00	7.47	7.05	-3.10	3.03	5.24	5.65
NGDPD (USD Billion)	10.391	11.232	12.817	14.056	15.227	16.702	18.082	20.043	22.206	24.598	27.087	25.771	26.601	28.818	30.943

The total credits disbursed by all financial institutions in Cambodia (154 in total) were collected from the National Bank of Cambodia (2023), which consisted of 58 commercial banks, nine specialized banks, four microfinance deposit-taking institutions, and 83 non-deposit-taking microfinance institutions. This includes TCID_Bs (total credits of banks, nominal values in USD billion, for the period 2009-2023) and TCID_MFIs (total credits of MFIs, nominal values in USD billion, for the period 2009-2023). Table 3 shows the total credits of financial institutions.

Table 3: Total Credits of Financial Institutions

Variables	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
TCFID	2.845	3.568	4.990	6.769	8.717	11.548	15.090	17.263	21.181	26.518	33.579	39.248	48.172	56.641	59.303
TCID_Bs	2.544	3.156	4.353	5.892	7.410	9.531	12.066	14.126	16.911	21.089	27.786	33.069	40.385	47.184	54.153
TCID_ MFIs	0.300	0.412	0.638	0.877	1.307	2.017	3.023	3.136	4.270	5.429	5.793	6.180	7.787	9.457	5.150

The data were also collected in detail by the industries, represented by Bs (total credits of banks classified by industries, nominal values in USD billion, from 2009 to 2023), and

include 18 sectors: Agriculture, Forestry and Fishing (Bs_AFF), Credit Cards (Bs_CCL), Construction (Bs_CST), Financial Institutions (Bs_FIS), Hotels and Restaurants (Bs_H&R), Information Media and Telecommunications (Bs_IMT), Mining and Quarrying (Bs_M&Q), Manufacturing (Bs_MFT), Mortgages, Owner-Occupied Housing only (Bs_MHG), Personal Lending (Bs_PLG), Real Estate Activities (Bs_REA), Rental and Operational Leasing Activities (Bs_ROL), Retail Trade (Bs_RTT), Transport and Storage (Bs_T&S), Utilities (Bs_UTL), Wholesale Trade (Bs_WST), Other Non-Financial Services (Bs_NFS), and Other Lending (Bs_OLG). These are shown in Table 4.

Table 4: Total Credits of Banks Classified by Industries

Variables	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Bs_FIS	0.035	0.042	0.080	0.133	0.117	0.186	0.324	0.250	0.468	0.750	1.254	1.416	1.773	2.016	1.918
Bs_AFF	0.171	0.211	0.386	0.567	0.718	0.953	1.229	1.519	1.750	1.873	2.145	2.588	3.156	3.788	4.712
Bs_M&Q	0.003	0.013	0.003	0.021	0.039	0.023	0.063	0.073	0.060	0.058	0.062	0.132	0.172	0.224	0.267
Bs_MFT	0.222	0.275	0.399	0.547	0.813	0.883	0.918	0.975	1.058	1.129	1.167	1.307	1.567	1.994	2.285
Bs_UTL	0.013	0.017	0.051	0.056	0.047	0.085	0.102	0.091	0.127	0.142	0.243	0.406	0.504	0.472	0.591
Bs_CST	0.218	0.222	0.324	0.443	0.573	0.775	0.924	1.229	1.581	1.938	2.522	3.160	3.767	4.431	5.099
Bs_WST	0.327	0.553	0.627	1.039	1.338	1.807	2.053	2.001	2.072	2.403	2.898	3.148	3.793	4.520	4.719
Bs_RTT	0.464	0.566	0.785	0.917	1.100	1.436	1.898	2.465	3.006	3.403	4.271	5.095	6.387	7.497	9.099
Bs_H&R	0.305	0.307	0.323	0.351	0.459	0.546	0.698	0.719	0.757	0.995	1.169	1.277	1.795	2.046	2.058
Bs_T&S	0.042	0.060	0.067	0.077	0.097	0.126	0.159	0.260	0.314	0.415	0.557	0.900	1.083	1.211	1.484
Bs_IMT	0.074	0.085	0.130	0.195	0.116	0.073	0.116	0.152	0.139	0.178	0.231	0.279	0.304	0.250	0.263
Bs_ROL	0.011	0.024	0.072	0.076	0.086	0.161	0.210	0.271	0.388	0.664	0.942	0.882	0.664	0.673	0.699
Bs_REA	0.160	0.146	0.139	0.182	0.249	0.379	0.580	0.703	0.992	1.546	2.252	2.718	3.475	4.411	5.429
Bs_NFS	0.212	0.313	0.400	0.589	0.747	0.864	1.010	1.127	1.217	1.428	1.665	1.763	2.069	2.441	2.688
Bs_PLG	0.181	0.163	0.215	0.244	0.308	0.420	0.656	0.939	1.143	1.737	2.652	3.199	3.733	3.762	5.029
Bs_CCL	0.004	0.006	0.008	0.009	0.012	0.013	0.020	0.032	0.038	0.047	0.057	0.061	0.088	0.128	0.174
Bs_MHG	0.091	0.114	0.270	0.327	0.396	0.603	0.857	1.099	1.560	2.125	3.377	4.462	5.503	6.690	6.967
Bs_OLG	0.011	0.040	0.073	0.120	0.196	0.197	0.251	0.218	0.243	0.258	0.322	0.276	0.553	0.628	0.674

The detailed data of MFIs (total credits of MFIs classified by industries, nominal values in

USD billion, from 2009 to 2023) was also extracted. Those nine sectors include: Agriculture (MFIs_AGR), Construction (MFIs_CST), Financial Institutions (MFIs_FIS), Household (MFIs_HHD), Manufacturing (MFIs_MFT), Services (MFIs_SER), Trade and Commerce (MFIs_T&C), Transportation (MFIs_TST), and Others (MFIs_OLG). Table 5 shows the total credits of MFIs classified by industries.

Table 5: Total Credits of MFIs Classified by Industries

Variables	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
MFIs_FIS	-	-	-	-	-	-	-	-	0.001	0.003	0.006	0.007	0.008	0.008	0.007
MFIs_AGR	0.127	0.174	0.263	0.346	0.496	0.746	1.065	1.043	1.089	1.143	1.177	1.159	1.396	1.686	1.135
MFIs_MFT	-	-	-	-	-	-	-	-	0.032	0.037	0.042	0.058	0.125	0.173	0.152
MFIs_T&C	0.106	0.119	0.164	0.213	0.298	0.426	0.585	0.581	0.802	0.955	1.082	1.329	1.786	2.205	1.043
MFIs_SER	0.023	0.039	0.066	0.090	0.139	0.208	0.322	0.310	0.446	0.595	0.910	0.996	1.124	1.282	0.587
MFIs_TST	0.011	0.015	0.019	0.039	0.049	0.077	0.104	0.135	0.198	0.273	0.363	0.362	0.403	0.418	0.144
MFIs_CST	0.007	0.011	0.018	0.033	0.064	0.091	0.113	0.101	0.169	0.227	0.211	0.261	0.337	0.427	0.358
MFIs_HHD	0.023	0.044	0.092	0.129	0.217	0.440	0.793	0.892	1.441	1.993	1.836	1.881	2.520	3.138	1.606
MFIs_OLG	0.003	0.010	0.016	0.028	0.044	0.029	0.041	0.075	0.093	0.204	0.166	0.128	0.088	0.119	0.118

Statistical Analysis and Tools

The statistical tools used in this study are the simple and multiple regressions.

The simple linear regression formula describes the relationship between two continuous variables: an independent variable (X) and a dependent variable (Y) (Field et al., 2012).

Formula: $Y = \beta_0 + \beta_1 X + \varepsilon$

- Y: This represents the predicted value of the dependent variable. Essentially, it is the value a researcher tries to predict based on the independent variable.
- β_0 (beta-naught): This is the y-intercept of the regression line. It represents the predicted value of Y when the independent variable (X) equals zero.
- β_1 (beta-one): This is the slope of the regression line. It tells how much Y is expected to change for every one-unit increase in X.

- X: This represents the independent variable that influences the dependent variable.
- ε (epsilon): This represents the error term. It captures the random error or unexplained variance in the data that is not accounted for by the linear relationship between X and Y.

Multiple regression extends the concept of simple regression to analyze the relationship between one dependent variable (Y) and multiple independent variables (X_1 to X_n) (Field et al., 2012).

Formula: $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta X + \varepsilon$

- Y: This represents the predicted value of the dependent variable.
- β_0 (beta-naught): This is the y-intercept, representing the predicted value of Y when all independent variables (X) are zero.
- β_i (beta-i): These represent the regression coefficients for each independent variable (X_i). They indicate the expected change in Y for a one-unit increase in X_i, holding all other independent variables constant.
- X_1 to X: These represent the multiple independent variables influencing the dependent variable.
- ε (epsilon): This represents the error term, capturing unexplained variance in the data.

Analysis Models

This study employs four main models: two simple regression models and two multiple regression models. Prior to estimation using the SPSS software, the data were transformed into logarithmic values. Logarithmic transformations are applied because they help mitigate issues of non-stationarity and multicollinearity, stabilize the variance of economic time series, and enable coefficients to be interpreted in terms of elasticities or percentage changes, providing more meaningful economic insights (Gujarati & Porter, 2009).

Model 1 analyzes the relationship between a dependent variable (NGDPD) and an explanatory variable (TCID_Bs), and the relationship between a dependent variable (NGDPD) and an explanatory variable (TCID_MFIs).

$$\textbf{MODEL 1: } \ln(Y_i) = \alpha_i + \beta_i \ln(X_i) + \varepsilon_i$$

$Where, for\ i = n\ Observations$:

$Y_i = Dependent\ Variable$

$X_i = Explanatory\ Variable$

$\alpha_i = Y{\sim}intercept\ (Constant\ term)$

$\beta_i = Slope\ coefficient\ of\ the\ explanatory\ variable$

$\varepsilon_i = The\ model's\ error\ term\ (also\ known\ as\ the\ Residuals)$

$$\textbf{MODEL 1.1: } \ln(NGDPD_i) = \alpha_i + \beta_i \ln(TCID\_Bs_i) + \varepsilon_i$$

Where,

$NGDPD_i$ = Gross domestic product of Cambodia, in current prices in USD Billion, for the period 2009-2023.

$TCID\_Bs_i$ = Total credits of banks, nominal values in USD Billion, for the period of 2009-2023.

$$\textbf{MODEL 1.2: } \ln(NGDPD_i) = \alpha_i + \beta_i \ln(TCID\_MFIs_i) + \varepsilon_i$$

Where,

$NGDPD_i$ = Gross domestic product of Cambodia, in current prices in USD billion, for the period 2009-2023.

$TCID\_MFIs_i$ = Total credits of MFIs, nominal values in USD million, for the period 2009-2023.

Model 2 analyzes the relationship between a dependent variable (NGDPD) and explanatory variables (Bs) and the relationship between a dependent variable (NGDPD) and explanatory variables (MFIs).

$$\textbf{MODEL 2: } \ln(Y_i) = \alpha_i + \beta_1 \ln(X_{i1}) + \beta_2 \ln(X_{i2}) + \cdots + \beta_p \ln(X_{ip}) + \varepsilon_i$$

$Where, for\ i = n\ Observations; for\ p = n\ explanatory\ variables$:

$Y_i = Dependent\ Variable$

$X_i = Explanatory\ Variables$

$\alpha_i = Y{\sim}intercept\ (Constant\ term)$

$\beta_p = Slope\ coefficients\ for\ each\ explanatory\ variable$

$\varepsilon_i = The\ model's\ error\ term\ (also\ known\ as\ the\ Residuals)$

MODEL 2.1: $\boldsymbol{\ln(NGDPD_i) = \alpha_i + \beta_1 \ln(Bs_{i1}) + \beta_2 \ln(Bs_{i2}) + \cdots + \beta_p \ln(Bs_{ip}) + \varepsilon_i}$

$NGDPD_i$ = Gross domestic product of Cambodia, in current prices in USD Billion, for the period 2009-2023.

Bs_i = Total credits of banks classified by industries, nominal values in USD Billion, from 2009 to 2023.

MODEL 2.2: $\boldsymbol{\ln(NGDPD_i) = \alpha_i + \beta_1 \ln(MFIs_{i1}) + \beta_2 \ln(MFIs_{i2}) + \ldots + \beta_p \ln(MFIs_{ip}) + \varepsilon_i}$

$NGDPD_i$ = Gross domestic product of Cambodia, in current prices in USD billion, for the period 2009-2023.

$MFIs_i$ = Total credits of MFIs classified by industries, nominal values in USD billion, from 2009 to 2023.

Significance of Models

The F-test is a statistical test commonly used in regression analysis to assess the overall significance of the model (Montgomery & Myers, 2009). It compares the fit of the regression model with a null model containing only the intercept (no independent variables) to determine whether the independent variables jointly contribute to explaining a statistically significant amount of variance in the dependent variable (Field et al., 2012).

The null hypothesis in the F-test states that the fit of the model with no predictors (an intercept-only model) is not significantly different from the fit of the complete regression model. The alternative hypothesis states that the fit of the entire model is significantly better than the intercept-only model (Field et al., 2012).

The p-value associated with the F-statistic indicates the probability of observing the calculated F-statistic if the null hypothesis were true (Montgomery & Myers, 2009).

- Significant F-test (low p-value): If the p-value is less than a chosen significance level, we reject the null hypothesis. This implies that the independent variables in the model jointly contribute significantly to explaining the variance in the dependent variable.

- Non-significant F-test (high p-value): If the p-value is greater than the significance level, we fail to reject the null hypothesis. This suggests that the independent variables do not jointly explain a statistically significant amount of variance beyond the mean.

4. FINDINGS

Correlation Analyses

A Pearson correlation matrix shows the relationships between variables. In this study, the correlations between variables, for the period of 2009 to 2023, are analyzed subsequently, i.e., the correlation between the NGDPD (GDP of Cambodia) and the Bs (total credits of banks classified by industries), as shown in Table 6. The correlation between NGDPD and the MFIs (total credits of MFIs classified by industries) is shown in Table 7.

Table 6: Correlation Matrix of Model 2.1 Table 6: Correlation Matrix of Model 2.1

	NGDPD	*Bs_ FIS*	*Bs_ AFF*	*Bs_ M&Q*	*Bs_ MFT*	*Bs_ UTL*	*Bs_ CST*	*Bs_ WST*	*Bs_ RTT*	*Bs_ H&R*	*Bs_ T&S*	*Bs_ IMT*	*Bs_ ROL*	*Bs_ REA*	*Bs_ NFS*	*Bs_ PLG*	*Bs_ CCL*	*Bs_ MHG*	*Bs_ OLG*
NGDPD	1																		
Bs_FIS	0.986	1																	
Bs_AFF	0.985	0.973	1																
BsM&Q	0.910	0.898	0.934	1															
Bs_MFT	0.959	0.942	0.989	0.939	1														
Bs_UTL	0.962	0.982	0.970	0.883	0.948	1													
Bs_CST	0.992	0.990	0.985	0.918	0.960	0.975	1												
Bs_WST	0.968	0.959	0.989	0.955	0.990	0.956	0.967	1											

(To be continued)

Table 6: Correlation Matrix of Model 2.1 (continued)

	NGDPD	Bs_FIS	Bs_AFF	Bs_M&Q	Bs_MFT	Bs_UTL	Bs_CST	Bs_WST	Bs_RTT	Bs_H&R	Bs_T&S	Bs_IMT	Bs_ROL	Bs_REA	Bs_NFS	Bs_PLG	Bs_CCL	Bs_MHG	Bs_OLG
Bs_RTT	0.991	0.987	0.985	0.921	0.958	0.976	0.998	0.96	1										
Bs_H&R	0.968	0.975	0.956	0.907	0.931	0.958	0.986	0.94	0.987	1									
Bs_T&S	0.975	0.980	0.958	0.905	0.924	0.967	0.990	0.94	0.992	0.989	1								
Bs_IMT	0.816	0.858	0.801	0.747	0.752	0.864	0.827	0.77	0.831	0.806	0.848	1							
Bs_ROL	0.972	0.959	0.964	0.865	0.935	0.942	0.950	0.95	0.947	0.900	0.92	0.799	1						
Bs_REA	0.974	0.977	0.947	0.891	0.911	0.948	0.987	0.92	0.986	0.993	0.992	0.810	0.907	1					
Bs_NFS	0.984	0.973	0.996	0.949	0.990	0.967	0.982	1	0.981	0.955	0.956	0.802	0.964	0.944	1				
Bs_PLG	0.982	0.983	0.956	0.886	0.915	0.958	0.990	0.93	0.989	0.987	0.993	0.836	0.930	0.996	0.951	1			
Bs_CCL	0.985	0.976	0.976	0.916	0.950	0.964	0.990	0.95	0.996	0.985	0.989	0.833	0.930	0.982	0.972	0.984	1		
BsMHG	0.991	0.995	0.986	0.907	0.959	0.987	0.996	0.97	0.996	0.978	0.986	0.849	0.964	0.977	0.983	0.985	0.987	1	
Bs_OLG	0.907	0.896	0.950	0.918	0.971	0.915	0.898	0.97	0.902	0.862	0.859	0.740	0.918	0.830	0.962	0.840	0.893	0.911	1

The correlation matrix shown in Table 6 demonstrates the degree of association between Cambodia's GDP and various categories of bank and MFI credits. The results indicated that almost all credit sectors exhibit a robust positive correlation with NGDPD, with coefficients typically above 0.95. For instance, construction credits (Bs_CST), retail and trade (Bs_RTT), and manufacturing and housing (Bs_MHG) display some of the highest correlations, exceeding 0.99, suggesting that growth in these sectors' credits closely aligns with overall economic performance. Even the lowest correlation, observed in information and technology (Bs_IMT) at approximately 0.82, still reflects a substantial positive relationship. Furthermore, the matrix reveals that the independent variables themselves are highly correlated with one another, often above 0.90, which highlights that sectoral credits strongly move together with GDP.

Table 7: Correlation Matrix of Model 2.2

	NGDPD	*MFIs_FIS*	*MFIs_AGR*	*MFIs_MFT*	*MFIs_T&C*	*MFIs_SER*	*MFIs_TST*	*MFIs_CST*	*MFIs_HHD*	*MFIs_OLG*
NGDPD	1									
MFIs_FIS	-0.809	1								
MFIs_AGR	0.936	-0.669	1							
MFIs_MFT	-0.769	0.974	-0.636	1						
MFIs_T&C	0.971	-0.774	0.960	-0.731	1					
MFIs_SER	0.971	-0.763	0.970	-0.740	0.992	1				
MFIs_TST	0.951	-0.779	0.961	-0.770	0.981	0.990	1			
MFIs_CST	0.975	-0.744	0.978	-0.700	0.979	0.982	0.963	1		
MFIs_HHD	0.968	-0.761	0.988	-0.732	0.981	0.989	0.983	0.986	1	
MFIs_OLG	0.934	-0.754	0.927	-0.759	0.902	0.936	0.936	0.938	0.950	1

Table 7 shows that Cambodia's GDP is strongly and positively correlated with MFIs' credits to construction (MFIs_CST, 0.975), services (MFIs_SER, 0.971), trade and commerce (MFIs_T&C, 0.971), and households (MFIs_HHD, 0.968). In contrast, credits to financial institutions (MFIs_FIS, -0.809) and manufacturing (MFIs_MFT, -0.769) are negatively correlated with GDP. Moreover, high intercorrelations among sectors, for instance, MFIs_SER and MFIs_T&C (0.992), suggest that MFIs' credit flows are closely interconnected.

Simple Regression Analyses

The simple regression analyses were conducted to examine the relationship between two variables: NGDPD of Cambodia and the total credits of banks (TCID_Bs), as shown in Table 8 and the total credits of MFIs (TCID_MFIs), shown in Table 9. The goal of these analyses is to understand how changes in TCID_Bs and TCID_MFIs are associated with changes in NGDPD.

Table 8: Simple Regression of Model 1.1

Regression			*F*	*Significance F*
Model 1.1		(* p < 0.05)	793.0444	0.000
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.0202	0.0353	57.1943	0.000
TCID_Bs	0.3595	0.0128	28.1610	0.000

The regression model of Model 1.1 exhibits a strong fit to the data, as evidenced by the F-statistic: 793.0444, with a p-value of 0.000, confirming the overall significance of the model. The regression analysis indicates a strong positive relationship between NGDPD and TCID_Bs in Cambodia. The model explains a substantial portion of the variation in NGDPD, and the coefficient for TCID_Bs is statistically significant (p-value < 0.05), suggesting that TCID_Bs has a significant positive impact on NGDPD. This implies that an increase in TCID_Bs is associated with an increase in NGDPD, holding other factors constant. For every 1% increase in TCID_Bs, NGDPD is predicted to increase by 0.3595%. These findings suggest that TCID_Bs is a significant predictor of NGDPD in the Cambodian context.

Table 9: Simple Regression of Model 1.2

Regression			*F*	*Significance F*
Model 1.2		(* p < 0.05)	232.6466	0.000
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.6779	0.0285	93.8770	0.000
TCID_MFIs	0.3136	0.0206	15.2528	0.000

The regression model of Model 1.2 demonstrates a strong fit, with an R-squared of 0.9471 and a significant F-statistic of 0.000. The analysis reveals a significant positive relationship between NGDPD and TCID_MFIs (the coefficient is statistically significant with p-value < 0.05), indicating that increases in TCID_MFIs are associated with increases in NGDPD. For every 1% increase in TCID_MFIs, NGDPD is predicted to increase by 0. 3136%. This suggests that TCID_MFIs is a crucial predictor of economic growth in Cambodia.

Multiple Regression Analyses

Multiple regression analyses were conducted to examine the relationship between Cambodia's NGDPD and the total credits of banks classified by specific industries, as shown in Table 10. The relationship between Cambodia's NGDPD and the total credits of MFIs classified by specific industries is shown in Table 11. The goal of these analyses is to understand how changes in these banks' and MFIs' industrial credits are associated with changes in NGDPD.

Table 10: Multiple Regression of Model 2.1

Regression			*F*	*Significance F*
Model 2.1		(* p < 0.05)	3819.0059	0.000
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Bs_AFF	0.1230	0.0188	6.5539	0.001
Bs_M&Q	-0.0505	0.0065	-7.7370	0.000
Bs_UTL	-0.1072	0.0120	-8.9472	0.000
Bs_H&R	-0.3186	0.0512	-6.2247	0.001
Bs_IMT	0.0449	0.0097	4.6200	0.004
Bs_ROL	0.0358	0.0092	3.9005	0.008
Bs_REA	0.3425	0.0295	11.5978	0.000
Bs_OLG	0.1256	0.0154	8.1652	0.000

The regression results of Model 2.1 indicated a significant model (significance F of 0.000), showing that sectoral bank credits explain nearly all variations in Cambodia's nominal GDP. The coefficients suggest that a 1% increase in credits to Real Estate (Bs_REA) leads to a 0.34% rise in GDP, while Agriculture, Forestry and Fishing (Bs_AFF) and Other Lending (Bs_OLG) contribute about 0.12% each. Credits to Information Media and Telecommunications (Bs_IMT) and Rental and Operational Leasing Activities (Bs_ROL) raise GDP by 0.04% and 0.036%, respectively. In contrast, a 1% increase in credits to Hotels and Restaurants (Bs_H&R) reduces GDP by 0.32%, Utilities (Bs_UTL) by 0.11%, and Mining and Quarrying (Bs_M&Q) by 0.05%. These findings highlight that while most bank lending stimulates economic expansion, specific sectors exert adverse effects, reflecting variations in sectoral efficiency and their contribution to Cambodia's growth.

Table 11: Multiple Regression of Model 2.2

Regression			*F*	*Significance F*
Model 2.2		(* p < 0.05)	152.4812	0.000
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.4955	0.1431	24.4256	0.000
MFIs_AGR	-0.4531	0.1348	-3.3617	0.006
MFIs_T&C	0.2318	0.0760	3.0494	0.011
MFIs_HHD	0.2587	0.0868	2.9792	0.013

The regression model of Model 2.2 demonstrates a strong fit, with a significant F-statistic (p-value < 0.000). The analysis that MFIs' sectoral credits explain most of the variation in Cambodia's NGDPD, with the coefficients being statistically significant with a p-value <

0.05. The coefficients reveal that a 1% increase in Household credits (MFIs_HHD) leads to a 0.26% rise in GDP, while Trade and Commerce credits (MFIs_T&C) raise GDP by 0.23%. Conversely, Agricultural credits (MFIs_AGR) show a significant negative impact, with a 1% increase associated with a 0.45% decline in GDP. These results suggest that while household and trade-related lending by MFIs stimulates economic growth, agricultural lending may contribute adversely, possibly due to inefficiencies or structural challenges in the sector.

Results of Hypotheses Testing

In all four models, the null hypothesis (H_0) is rejected, as shown in Table 12. This means that there is strong evidence to suggest that the regression models are statistically significant and that the independent variables collectively explain a significant portion of the variation in the dependent variable. As can be seen in Table 12, a small p-value (Significance F (0.000)) indicates that the model is statistically significant. It is evident that the total credits of Banks (Model 1.1) and the total credits of MFIs (Model 1.2) have a significant effect on economic growth in Cambodia. It is also evident that there is a significant effect of total credits of each industry from the banks (Model 2.1) and from MFIs (Model 2.2) on the economic growth in Cambodia.

Table 12: Hypothesis Results

Regression	Hypothesis	Significance F
Model 1.1	H_0 is rejected.	0.000
Model 1.2	H_0 is rejected.	0.000
Model 2.1	H_0 is rejected.	0.000
Model 2.2	H_0 is rejected.	0.000

Discussion

The regression findings confirm that both bank and microfinance credits significantly contribute to Cambodia's economic growth. Models 1.1 and 1.2 show strong positive relationships between total credit disbursement (TCID_Bs and TCID_MFIs) and nominal GDP, consistent with financial development theories emphasizing the growth-enhancing role of credit (Levine, 2002). These results align with Samreth (2022), who found that Cambodia's financial deepening supports long-term GDP expansion.

Sectoral analyses (Models 2.1 and 2.2) highlight that the allocation of credit determines growth outcomes. Bank lending to Real Estate and Agriculture sectors positively affects GDP, supporting previous evidence that productive credit allocation stimulates investment and employment (Beck et al., 2012). Conversely, negative coefficients in Hotels and Restaurants, Utilities, and Mining sectors suggest inefficiencies or low returns, consistent with Phan et al. (2020). For MFIs, Household and Trade credits enhance growth, reflecting the pro-growth role of inclusive finance (Banerjee & Duflo, 2014; Imai et al., 2012). However, Agricultural credits negatively affect GDP, likely due to structural inefficiencies and low productivity (ADB, 2021; Cuong, 2020).

Overall, while Cambodia's financial intermediation significantly drives growth, the results underscore the need for improved sectoral credit allocation, particularly toward productive and high-efficiency sectors, to sustain inclusive economic expansion.

5. CONCLUSION AND IMPLICATIONS

Summary of Findings

The simple regression analyses indicate strong positive relationships between NGDPD and both TCID_Bs and TCID_MFIs, suggesting that the total credits from banks and MFIs are significant predictors of economic growth in Cambodia. Both models exhibit strong fit and significant F-statistics, confirming the overall significance of the models. The coefficients for TCID_Bs and TCID_MFIs are statistically significant, indicating their positive impact on NGDPD. Increases in TCID_Bs (1%) and TCID_MFIs (1%) are associated with increases in NGDPD (0.3595% and 0.3136% respectively), suggesting their crucial role in economic growth.

The multiple regression analyses reveal that lending to specific sectors by banks and MFIs can significantly impact Cambodia's economic growth. For banks' credits, a 1% increase in credits to Real Estate (Bs_REA) raises NGDPD by 0.34%, Agriculture, Forestry and Fishing (Bs_AFF) and Other Lending (Bs_OLG) by 0.12% each, Information Media and Telecommunications (Bs_IMT) by 0.04%, and Rental and Operational Leasing (Bs_ROL) by 0.036%, while credits to Hotels and Restaurants (Bs_H&R), Utilities (Bs_UTL), and Mining and Quarrying (Bs_M&Q) reduce NGDPD by 0.32%, 0.11%, and 0.05%, respectively. For MFIs' credits, a 1% increase in Household credits (MFIs_HHD) raises NGDPD by 0.26% and Trade and Commerce credits (MFIs_T&C) by 0.23%, whereas

Agricultural credits (MFIs_AGR) reduce NGDPD by 0.45%. These results indicate that while most sectoral lending promotes economic growth, specific sectors can have adverse effects depending on their efficiency and economic contribution.

Implications

The study suggests that lending to specific industries by banks and MFIs has differential effects on Cambodia's economic growth. These findings have several implications for policymakers and financial institutions:

- Banks and MFIs can diversify their lending portfolios to reduce their exposure to any particular sector and mitigate risks. This can help ensure the stability of the financial system and promote sustainable economic growth.
- Financial regulators can implement targeted regulations to address potential negative impacts of lending to specific sectors. This could include measures to improve risk management practices or limit lending exposure to these sectors.
- Policymakers can prioritize lending to sectors that have been shown to have a positive impact on economic growth. This could involve providing incentives or subsidies to banks and MFIs to encourage lending to these sectors.
- Effective economic development policies require coordination between the government, financial institutions, and other relevant stakeholders. By understanding the differential effects of lending on economic growth, policymakers can develop targeted policies to promote sustainable and inclusive development.

Overall, the findings of this study provide valuable insights for policymakers and financial institutions in Cambodia. By understanding the differential effects of lending to different sectors, they can develop more effective policies and strategies to promote economic growth and development.

Limitations and Suggestions for Future Research

This study investigates the impact of financial institutions' credit allocation on economic growth in Cambodia, with a focus on industry-specific effects. While it provides valuable insights, several limitations should be acknowledged. First, data availability poses a

challenge, as accessing comprehensive and disaggregated information on credit distribution across all industries in Cambodia is limited, and the time series data are relatively short. Second, issues of causality versus correlation remain, since establishing a definitive causal link between credit allocation and industry-specific economic growth is complex; other external factors may also influence growth patterns.

To address these limitations, this study relies on the most recent and reliable data from financial institutions, government agencies, and reliable research sources. Additionally, robust econometric techniques are applied to isolate the effects of credit on industry-level growth while controlling for other potential determinants. Future research could expand on this study by incorporating longer time series, broader datasets, or alternative econometric approaches, such as panel data or structural modeling, to better capture causal relationships and provide a more comprehensive understanding of how financial institutions' credit allocation influences economic growth across Cambodia's industries.

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