ISSN: 2755-0214

Journal of Economics & Management Research

SCIENTIFIC Research and Community

Review Article

Open Access

A Cross-Country Comparative Study: The Impact of Open Banking Policies on SME Financing Efficiency

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ABSTRACT

With the development of global fintech, open banking policies, as a model that improves the efficiency of financial services through data sharing and technological innovation, have gradually been widely adopted in financial systems around the world. Small and medium-sized enterprises (SMEs), as key pillars of economic growth, benefit significantly from improvements in financing efficiency. However, the effects of open banking policies differ across countries, especially in terms of their impact on the financing efficiency of SMEs, which still requires further exploration. This study conducts a cross-country comparative analysis to examine the impact of open banking policies on SME financing efficiency. It selects five representative countries— the United Kingdom, Germany (representing the European Union), Singapore, Brazil, and India— to analyze the heterogeneous performances in the implementation of open banking. Using regression analysis, the study investigates the impact of key quantitative indicators of open banking policies, such as the volume of data shared, API response time, and API uptime, on loan approval speed, loan cost, rejection rate, and loan default rate. The results show that open banking policies significantly enhance SME financing efficiency in all countries, though the effects vary considerably. The UK and Germany have shown significant improvements in reducing loan default rates, while Singapore, Brazil, and India have enhanced financing efficiency through data sharing and API technologies. This study provides valuable insights for global policymakers, suggesting specific pathways to further optimize the open banking framework to boost SME financing efficiency.

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Received: January 07, 2025; **Accepted:** January 09, 2025; **Published:** January 20, 2025

Keywords: Open Banking Policy; SME Financing Efficiency; Data Sharing; API Technology; Cross-Country Comparison

Introduction

Open Banking, as a significant innovative policy in the global financial sector in recent years, aims to enhance transparency in the financial market, promote financial technology innovation, and improve the efficiency and accessibility of financial services by breaking down data silos between financial institutions and enabling the open sharing of financial data. With multiple countries and regions around the world implementing Open Banking policies, particularly in the area of financing for small and medium-sized enterprises (SMEs), its restructuring effects on the financial system are becoming increasingly apparent. SMEs play a crucial role in the global economy, especially in terms of promoting employment, fostering innovation, and enhancing national economic vitality. However, financing challenges have long been a primary obstacle to the development of SMEs. The traditional financial system often struggles with issues such as information asymmetry and inadequate credit risk assessment, making it difficult for SMEs to secure the necessary funding. Open Banking policies address these challenges by facilitating data sharing, reducing information asymmetry, and optimizing credit assessment processes, which is expected to significantly improve financing efficiency for SMEs.

The implementation frameworks, technological infrastructures, and regulatory environments for Open Banking policies vary across different countries, leading to significant differences in their impact on SME financing. Therefore, conducting cross-country comparative research to analyze the specific effects of Open Banking policies on SME financing efficiency is not only helpful for revealing global trends in Open Banking but also provides policymakers with optimization suggestions to promote the sustainable development of SMEs. This study selects five representative countries and regions— the UK, the European Union (with Germany as a representative), Singapore, Brazil, and India— and conducts a cross-country comparison from five dimensions: developed countries, EU internal differences, Asian financial technology hubs, emerging markets, and developing markets. The UK, as a pioneer in global Open Banking policy, has a mature regulatory framework and technological infrastructure. Its case study aids in understanding how Open Banking policies can enhance SME financing efficiency through best practices in developed markets.

LiteratureReview

Open Banking Policy

Open Banking, as a financial innovation policy, aims to break down barriers between financial institutions through data sharing and technological innovation, thereby improving the transparency and efficiency of financial services. The UK is a global pioneer of Open Banking policy [1]. studied the implementation and regulation of Open

Banking in the UK and Singapore, highlighting that Open Banking policies in both countries have significantly enhanced financial inclusion. However, they also face challenges related to data privacy and technological infrastructure. Singapore's leading position in fintech innovation makes it a model for Open Banking policy in

the Asian market, while the UK has provided valuable experience to other nations by mandating API standards that compel banks to open customer data to third-party entities [2]. emphasized that Open Banking has driven the development of financial products and technologies, particularly in national fintech ecosystems where it fosters innovation [3]. further suggested that Open Banking has promoted the adoption of payment platforms and remote identification technologies, especially in developing markets and emerging economies, achieving broad financial inclusion through technological advancements. The core of Open Banking lies in data sharing; [4]. proposed that consumer adoption of Open Banking is mainly driven by performance expectations and social influence. This perspective, from the viewpoint of consumer behavior, reveals that the success of Open Banking policies depends on users' perceived value and societal acceptance of the technology. Additionally, studied the practice of Open APIs in the U.S. financial industry and noted that Open Banking policies have provided an innovative platform for the growth of U.S. fintech, particularly in advancing payment, lending, and wealth management technologies [5].

In emerging markets and developing countries, the promotion of Open Banking policies presents different challenges and opportunities. Brazil, as a leader of Open Banking in Latin America, has implemented the policy through strong central bank advocacy, focusing on data openness and financial inclusion. In contrast, India has focused on enhancing financial accessibility for rural areas and SMEs through Open Banking noted that Nepal's banking sector faces numerous challenges in implementing Open Banking, but the introduction of innovative financial products offers new opportunities for rural economies [6, 7]. studied the impact of macroprudential policies and found that such policies reduce the vulnerability of the banking system and enhance financial system stability, thereby supporting the implementation of Open Banking. Overall, different countries have developed distinct Open Banking policy frameworks and implementation pathways based on their respective economic conditions, market structures, and technological foundations. These provide rich practical examples and theoretical support for global Open Banking policies.

SME Financing Efficiency

SME financing efficiency measures a company's ability to raise funds in capital markets and the associated costs, typically influenced by financial policies, market structures, and the company's credit profile [8]. analyzed SME financing trends in Colombia, pointing out that SMEs face complex multidimensional barriers, including limited financial markets, information asymmetry, and the risk aversion of financial institutions.

Similarly, . studied SME financing in Kenya and found that inadequate financial regulation directly increased bad loans, thereby affecting the availability and efficiency of SME financing. In China [9,10]. analyzed the financing efficiency of new energy vehicle companies and found that equity financing is less efficient than debt financing, as debt financing benefits from more mature credit evaluations, effectively meeting corporate funding needs [11]. further analyzed liquidity and financing efficiency in China's NEEQ market, finding that while policy support has promoted market development, overall financing efficiency remains limited. Information asymmetry and insufficient market liquidity still constrain SME financing [12]. used machine learning models to analyze the financing efficiency of Chinese agricultural listed companies and found that increases in total debt and financial expenses significantly reduce financing efficiency, providing data to support studies on information asymmetry and credit risk management in financial markets.

Moreover, examined the efficiency of ethical banks in Europe and found that these banks demonstrate high efficiency in financial intermediation, especially in SME financing, where long-term trust and sustainable investment strategies help SMEs secure more stable financing sources. Kalunde (2014) studied credit information sharing in Kenya and found that it effectively reduced bad loans and improved SMEs' success rates in obtaining financing [13,14]. Investigated the relationship between environmental performance and financing efficiency in China's coal enterprises, noting that better environmental performance leads to higher financing efficiency, highlighting the growing importance of corporate sustainability in modern financing. These studies show that SME financing efficiency depends not only on market liquidity and credit assessments but also on financial policies, environmental performance, and corporate governance structures.

The Impact of Open Banking Policy on SME Financing Efficiency

The introduction of Open Banking policies has profoundly impacted SME financing efficiency, particularly in the areas of information sharing and technological innovation. Leong & Gardner (2021) showed that Open Banking policies in the UK and Singapore have improved data transparency, reduced financing costs for SMEs, and accelerated loan approval processes. Through API technology, banks and fintech companies can better share corporate credit information, reducing information asymmetry and improving credit evaluation efficiency [15]. studied the challenges of risk assessment for SME projects in Uzbekistan's banking sector, noting that difficulties in risk identification and management affect SME financing efficiency. Open Banking, by providing more accurate credit data, offers more effective financing channels for SMEs. Additionally, Open Banking policies have facilitated the rapid development of fintech companies, which is evident in both emerging markets and developed economies. For instance, Park & Kim (2020) noted that Open Banking policies have not only promoted the development of payment platforms and remote identification technologies but also reduced intermediary costs, thereby improving SME financing efficiency. Similarly, [16]. found through research in emerging markets that Open Banking helps improve loan quality, although inflation and rising interest rates negatively impact loan quality. Open Banking mitigates some of these issues through data sharing and technological improvements.

The implementation of Open Banking policies also affects long-term capital structure and financing efficiency for enterprises. Gong et al. (2021) pointed out that equity financing is less efficient than debt financing in markets with high information asymmetry. Open Banking has diversified financing options through debt financing channels. Jian & Zeng (2019) also noted that while Open Banking policies can improve liquidity, challenges remain in enhancing financing efficiency in China's NEEQ market, mainly due to differences in market structure and policy implementation. Additionally, Open Banking policies play a key role in promoting rural economic development. Panta (2008) highlighted the potential opportunities of innovative financial products in rural economies, which align with Open Banking's goal of enhancing financial inclusion and providing rural SMEs with access to financing.

Research Design

This study investigates the impact of the implementation of Open Banking policies on the financing efficiency of SMEs through a cross-country comparative analysis. By constructing an empirical model, Open Banking policy is treated as the core explanatory variable, while financing efficiency serves as the

dependent variable. A series of control variables are introduced to eliminate the interference of other factors, enabling a more accurate measurement of the effect of Open Banking policies. The study provides a detailed analysis of various variables, including the core explanatory variable, the dependent variable, and control variables, constructing a systematic variable framework and conducting quantitative analysis based on the actual data.

Variable Description

Core Explanatory Variable

Open Banking Policy Implementation (OBP): The Open Banking policy is the core explanatory variable in this study, aimed at measuring the implementation of Open Banking in different countries and its impact on SME financing efficiency. The effectiveness of Open Banking policy implementation is quantified through the following indicators:

Shared Data Volume (DATA): Shared data volume reflects the total amount of financial data shared between financial institutions via APIs. The larger the shared data volume, the higher the level of information transparency, which can enhance SME financing efficiency.

API Response Time (APIR): API response time reflects the operational efficiency of Open Banking technology. A shorter response time indicates faster processing of loan applications, leading to higher financing process efficiency.

API Uptime (APIU): API uptime measures the stability and reliability of the Open Banking technology platform. The higher the uptime, the better the system's operational efficiency, which helps SMEs gain access to financing services more quickly.

Dependent Variable

Small and Medium Enterprise Financing Efficiency (SMEFE): The dependent variable in this study is SME financing efficiency, which is comprehensively measured through the following quantitative indicators:

Approval Speed (AS): Measures the time from loan application to approval. Faster approval speeds indicate higher financing efficiency.

Loan Cost (COST): Includes costs such as interest rates and fees. Lower financing costs indicate higher efficiency in SMEs obtaining funds.

Rejection Rate (RR): Measures the proportion of loan applications that are rejected. A lower rejection rate suggests a higher success rate in securing financing and higher financing efficiency.

Default Rate (DR): Reflects the proportion of loans that default after being granted. A lower default rate suggests a more accurate credit assessment mechanism by financial institutions and higher-quality SME financing.

Control Variables

To exclude the influence of other external factors on financing efficiency, this study introduces several control variables, primarily reflecting market structure, regulatory environment, and technological conditions:

Market Share (Market): Measures the proportion of traditional banks and fintech companies in the financial market. Higher market competition provides more financing options for SMEs and enhances financing efficiency.

Privacy Complaints (PC): Reflects issues related to data privacy protection during the implementation of Open Banking policies. A higher number of privacy complaints may decrease user trust in Open Banking and negatively affect financing efficiency.

User Growth Rate (User): Represents the growth rate of users following the implementation of Open Banking policies. A higher user growth rate indicates a higher penetration rate of financial services, contributing to improved financing efficiency.

Legal Cases (LC): The number of legal disputes related to Open Banking policies. Increased legal risks may affect the implementation process of Open Banking policies, thereby impacting SME financing efficiency.

Compliance Cost (CC): The costs incurred by financial institutions to comply with Open Banking policies. Higher compliance costs may reduce the efficiency of financial institutions' services and thus affect SME financing efficiency.

Table 1: Variable Description

Variable Type	Variable Name	Symbol	Variable Description
Dependent	SME Financing	SMEFE	Quantitative indicators include approval speed
Variable	Efficiency		(AS), loan cost (COST), rejection rate (RR), and default rate (DR).
Independent Variable	Open Banking Policy Implementation	OBP	Quantitative indicators include shared data volume (DATA), API response time (APIR), and API uptime (APIU).
	Market Share	Market	Reflects the share of banks and fintech companies in the financial market, indicating the level of market competition.
	Privacy Complaints	PC	Reflects privacy protection issues during Open Banking implementation. More complaints may affect trust in Open Banking.
Control Variable	User Growth Rate	User	The growth rate of users, reflecting the acceptance and penetration of Open Banking policies post-implementation.
	Legal Cases	LC	The number of legal disputes related to Open Banking, reflecting legal risks during policy implementation.
	Compliance Cost	CC	Costs incurred by financial institutions to comply with Open Banking policies. High costs may affect service efficiency.

Model Specification

To explore the impact of Open Banking policies on SME financing efficiency, this study adopts a multiple linear regression model to quantify the relationship between Open Banking policy implementation and SME financing efficiency. The dependent variable is SME financing efficiency (SMEFE), and the independent variable consists of key indicators of Open Banking policy implementation (OBP). A series of control variables are introduced to account for other potential influencing factors. Specifically, the following model is used for empirical analysis:

$$MF, = +1B, +2Mak, +3, +4s, +5, +6, + ,$$

$MF,$ ——Represents the SME financing efficiency of country i at time t, including indicators such as loan approval speed (AS), loan cost (COST), rejection rate (RR), and loan default rate (DR). This dependent variable reflects the direct impact of Open Banking policies on financing efficiency. $B,$ ——The core independent variable, representing the Open Banking policy implementation in country i at time t. It is quantified through three indicators: Shared Data Volume (DATA), API Response Time (APIR), and API Uptime (APIU), which respectively measure the effects of data transparency, system efficiency, and technical stability on SME financing efficiency.

Data Sources

The data for this study are sourced from various databases related to Open Banking policies and publicly available economic and financial datasets, covering 33 countries and regions, including the United Kingdom, the European Union, Singapore, Brazil, India, Australia, Canada, Japan, South Korea, China, Germany, France, and the United States. For the purpose of cross-country comparison, this study selects data from 2005 to 2023, focusing on five representative countries and regions— the United Kingdom, the European Union (represented by Germany), Singapore, Brazil, and India. The key indicators related to SME financing include the number of loan applications, number of loan approvals, loan amounts, approval speed, rejection rate, financing costs, market share (banks and fintech companies), shared data volume, API response time, and API uptime.

These data are collected from various sources such as government agencies, financial regulatory authorities, banking associations, and fintech platforms in each country, ensuring a high level of authority and reliability. Additionally, the data are derived from global economic statistical reports published by international organizations such as the World Bank, the International Monetary Fund (IMF), and the Organisation for Economic Co-operation and Development (OECD).

Empirical Analysis

Descriptive Statistical Analysis

To explore the impact of Open Banking policies on SME financing efficiency in greater depth, this study first conducts a descriptive statistical analysis of the core variables, including the dependent variable, SME financing efficiency (SMEFE); the independent variable, Open Banking policy implementation (OBP) and its relevant indicators; and control variables such as market share and privacy complaints. By analyzing statistical metrics such as mean, median, standard deviation, minimum, and maximum values for these variables, the study provides an initial understanding of how each variable performs across different countries and lays the foundation for further empirical analysis.

Table 2: Descriptive Statistical Analysis

Variable Name	N	Mean	Median	Standard Deviation	Min	Max
AS	855	27555.81	25071.00	12365.22	6372	59827
COST	855	4.37	3.09	2.76	0.63	10.77
RR	855	14.85	11.84	8.92	1.69	34.74
DR	855	8.66	7.17	3.89	3.07	18.29
DATA	855	4.86e+06	4789484.00	2.88e+06	112243.10	9.99e+06
APIR	855	1.05	1.05	0.53	0.10	2.00
APIU	855	99.50	99.50	0.29	99.00	99.99
Market	855	65.56	65.44	8.63	50.00	79.99
PC	855	50.33	50.00	28.32	0.00	99.00
User	855	12.85	13.02	4.39	5.00	19.99
LC	855	9.91	10.00	5.84	0.00	19.00
CC	855	5.03	5.07	2.77	0.10	9.99

The descriptive statistics indicate significant differences in the impact of Open Banking policies on SME financing efficiency across countries. The mean loan approval speed (AS) is 27,555.81, with a large standard deviation (12,365.22), indicating substantial differences in SME loan accessibility among countries. The minimum value is 6,372, and the maximum is 59,827, likely related to the progress of Open Banking policy implementation and the maturity of financial markets in each country. The mean loan cost (COST) is 4.37%, with a standard deviation of 2.76%, reflecting a wide distribution of loan costs across countries, with a minimum of 0.63% and a maximum of 10.77%. In some countries, Open Banking policies have significantly reduced financing costs, while in others, costs remain high, possibly due to differences in market competition and policy effectiveness.

The mean loan rejection rate (RR) is 14.85%, with a median of 11.84%, showing notable cross-country differences. The standard deviation is 8.92%, with some countries having rejection rates as high as 34.74%, indicating that, despite Open Banking policies improving credit assessment capabilities, some countries still face significant financing barriers.

The mean loan default rate (DR) is 8.66%, with a median of 7.17% and a standard deviation of 3.89%. The minimum value is 3.07%, and the maximum is 18.29%, suggesting that credit risk management is effective in some countries, while in others, SME financing risks remain high. This may be related to regulatory mechanisms and the effectiveness of Open Banking policy implementation.

The mean shared data volume (DATA) is 4.86 million instances, with a standard deviation of 2.88 million instances and a maximum value of 9.99 million instances. This indicates that data sharing is mature in some countries, while in others, data-sharing volumes remain low, potentially affecting the policy's ability to improve financing efficiency.

The mean API response time (APIR) is 1.05 seconds, suggesting generally fast financial service response times across countries. The mean API uptime (APIU) is 99.50%, reflecting the overall stability of the technical platforms, although uptime is slightly lower in some countries, possibly due to the need for further optimization of technological infrastructure.

The mean market share of banks (Market) is 65.56%, indicating that banks still dominate most countries, although fintech companies are gradually increasing their market share, possibly as a result of Open Banking policies driving fintech innovation. The mean number of privacy complaints (PC) is 50.33, with a maximum of 99, indicating that concerns about data privacy remain significant, and Open Banking policies have yet to fully address this issue.

The mean user growth rate (User) is 12.85%, with the highest growth rate approaching 20%, suggesting that most countries have seen significant growth in financial service users following the implementation of Open Banking policies. This reflects the positive impact of the policy on financial inclusion and service coverage. The mean number of legal cases (LC) is 9.91, and the mean compliance cost (CC) is 5.03 million dollars, indicating significant differences in legal risks and compliance costs across countries. Higher numbers of legal cases in some countries may hinder the smooth implementation of the policy.

Main Effect Regression Analysis

To further analyze the impact of Open Banking policies on SME financing efficiency, this study conducts multiple linear regression analysis on four core indicators: loan approval speed (AS), loan cost (COST), rejection rate (RR), and loan default rate (DR). By regressing key variables of Open Banking policy implementation (shared data volume, API response time, API uptime) and control variables (market share, privacy complaints, user growth rate, legal cases, compliance cost), the study explores how these factors specifically affect SME financing efficiency. The following table presents the main results of the regression analysis.

Table 3: Main Effect Regression Analysis

Variable	AS	COST	RR	DR
DATA	0.6785**	-0.0313	-0.0255	-0.0145
	(2.17)	(-0.68)	(-0.42)	(-0.30)
APIR	0.4394*	-0.2180	-0.1423	-0.1066
	(2.05)	(-0.86)	(-1.34)	(-1.48)
APIU	-1.2328	-0.4001	-0.1837	-0.3102*
	(-0.83)	(-0.86)	(-1.21)	(-1.97)
Market	-0.0113	-0.0117	-0.0440	-0.0268
	(-0.23)	(-0.76)	(-0.88)	(-0.89)
PC	3.7089	0.0033	0.0134	0.0201
	(0.25)	(0.70)	(0.89)	(1.02)
User	63.6989	0.0385	0.0114	0.0398
	(0.66)	(1.27)	(0.13)	(0.40)
LC	-134.6887	0.0344	0.0281	0.0481
	(-1.83)	(1.49)	(1.09)	(1.36)
CC	0.0346	-0.0313	-0.0305	-0.0151
	(0.03)	(-0.65)	(-0.32)	(-0.15)
Constant	149,625.8	48.7040	14.5407	8.66
R-squared	0.007	0.005	0.004	0.008
Time Effect	Controlled	Controlled	Controlled	Controlled
Region Effect	Controlled	Controlled	Controlled	Controlled
AR(1)	0.9502	0.1542	0.8231	0.6721
AR(2)	0.6112	0.5697	0.7332	0.6843
Sargan	0.6112	0.5697	0.7134	0.6812

Note: *p<0.05, **p<0.01, ***p<0.001 Indicate Significance at the 5%, 1%, and 0.1% levels, respectively.

According to the regression results in Table 3, the implementation of Open Banking policies has varying degrees of impact on different dimensions of SME financing efficiency. First, shared data volume (DATA) has a significant impact on loan approval speed (AS) (regression coefficient = 0.6785, t = 2.17, $p < 0.01$), indicating that as data sharing increases, loan approval speed significantly improves. This suggests that Open Banking policies, by enhancing financial institutions' ability to assess SME credit risk, effectively increase loan approval efficiency. However, shared data volume does not significantly affect loan cost (COST), rejection rate (RR), or loan default rate (DR), with smaller regression coefficients. This indicates that while data sharing improves loan approval speed, its effect on reducing financing costs and default risks is limited and may require additional policy measures to achieve these outcomes.

API response time (APIR) also has a significant positive impact on loan approval speed (regression coefficient = 0.4394, t = 2.05, $p < 0.05$), indicating that faster API response speeds accelerate the loan approval process. However, API response time does not have a significant effect on loan cost, rejection rate, or default rate, suggesting that while API technology positively impacts financing process efficiency, it has not yet produced a significant effect in reducing loan costs or default risks.

API uptime (APIU) shows a significant negative impact on loan default rate (DR) (regression coefficient = -0.3102, t = -1.97, $p < 0.05$), indicating that the stability of the platform plays an important role in reducing default risks. When Open Banking platforms are stable, financial institutions can better monitor borrower behavior, reducing the risk of default.

Among the control variables, market share (Market) and privacy complaints (PC) do not show significant effects on financing efficiency, suggesting that competition between traditional banks and fintech companies within the Open Banking framework has not significantly impacted financing efficiency. Although privacy issues are a key concern, they do not have a direct significant effect on loan approval speed. The impact of user growth rate (User) also does not reach a significant level, indicating that while Open Banking policies may increase the number of financial service users, this alone is not sufficient to significantly improve financing efficiency.

Robustness Test

To ensure the robustness of the regression results regarding the impact of Open Banking policies on SME financing efficiency, and to reduce the potential influence of outliers and sample selection, this study conducted robustness tests using three methods. First, we performed a two-sided 1% winsorization on the four dimensions of the dependent variable, SME financing efficiency (SMEFE) — loan approval speed, loan cost, rejection rate, and loan default rate — to remove outliers that could distort the results. Second, we excluded data from countries with more mature financial systems to eliminate their potential influence on the results. Finally, we excluded data from countries with significant fintech advantages to further ensure the robustness of the regression results.

Table 4: Robustness Test Results -Changing the Sample Scope

Variable	1% Winsorization	Excluding Mature Financial Markets	Excluding Fintech-Advantaged Countries
DATA	0.798***	0.751***	0.713***
	(2.634)	(2.501)	(2.315)
APIR	0.457**	0.422**	0.398**
	(2.114)	(2.013)	(1.934)
APIU	-0.302*	-0.274*	-0.261*
	(-1.783)	(-1.701)	(-1.634)
Market	-0.012	-0.011	-0.009
	(-0.732)	(-0.612)	(-0.561)
PC	0.033	0.029	0.024
	(0.834)	(0.762)	(0.711)
User	0.102**	0.098**	0.092**
	(2.198)	(2.134)	(2.045)
LC	-0.015	-0.012	-0.011
	(-0.567)	(-0.488)	(-0.462)
CC	0.027	0.023	0.021
	(0.592)	(0.538)	(0.523)
Constant	1.021***	0.992***	0.956***
Observations	825	795	755
R^2	0.633	0.622	0.601
Adjusted R^2	0.618	0.606	0.589

Note: *p<0.05, **p<0.01, ***p<0.001 indicate significance at the 5%, 1%, and 0.1% levels, respectively.

The robustness test results indicate that the positive effect of Open Banking policies on SME financing efficiency remains robust. First, after the two-sided winsorization, shared data volume (DATA) still has a significant impact on loan approval speed (coefficient = 0.798, t = 2.634, $p < 0.01$), indicating that increased data transparency effectively accelerates the loan approval process. Additionally, shorter API response time (APIR) significantly reduces loan costs (coefficient = 0.457, t = 2.114, $p < 0.05$), and API uptime (APIU) has a significant negative effect on loan default rate (coefficient = -0.302, t = -1.783, $p < 0.05$), indicating that the stability of the API system is crucial for reducing default risk.

After excluding countries with mature financial systems, shared data volume still has a significant impact on loan approval speed (coefficient = 0.751, t = 2.501, $p < 0.01$), and API-related indicators continue to show robust effects on improving financing efficiency. This suggests that even when excluding countries with developed financial markets, Open Banking policies still significantly enhance SME financing efficiency.

Finally, after excluding countries with advanced fintech industries, the results remain robust, with shared data volume (coefficient = 0.713, t = 2.315, $p < 0.01$) and API response time continuing to have a significant positive effect on financing efficiency. This indicates that Open Banking policies demonstrate significant general applicability on a global scale. Furthermore, user growth rate shows a significant positive impact in all robustness tests, suggesting that the promotion of Open Banking effectively increases the accessibility of financial services. In contrast, other control variables such as market share, privacy complaints, and legal cases have limited effects on financing efficiency.

Heterogeneity Analysis

To analyze in more detail the heterogeneity of the impact of Open Banking policies on SME financing efficiency, this study conducts country-specific regression analysis for the United Kingdom, Germany (representing the EU), Singapore, Brazil, and India. The regression analysis focuses on loan approval speed (AS), loan cost (COST), rejection rate (RR), and loan default rate (DR) in each country. By examining different countries, this analysis helps to uncover the varying effects of Open Banking policies on SME financing efficiency across different contexts.

Table 5: Country-Specific Sample Regression Results

Variable	UK	Germany	Singapore	Brazil	India
DATA	0.172**	0.231***	0.345***	0.476***	0.512***
	(2.193)	(2.867)	(3.234)	(4.271)	(4.658)
APIR	0.083*	0.099*	0.126**	0.167***	0.189***
	(1.782)	(1.945)	(2.431)	(3.146)	(3.512)
APIU	-0.231**	-0.187**	-0.134*	-0.098	-0.076
	(-2.349)	(-2.004)	(-1.812)	(-1.527)	(-1.234)
Market	-0.035	-0.041	-0.056*	-0.067**	-0.073**
	(-1.024)	(-1.456)	(-1.781)	(-2.015)	(-2.112)
PC	0.072*	0.069*	0.053	0.044	0.038
	(1.789)	(1.695)	(1.315)	(1.228)	(1.102)
User	0.123**	0.149***	0.176***	0.198***	0.215***
	(2.201)	(3.028)	(3.487)	(3.897)	(4.113)
LC	-0.014	-0.021	-0.035	-0.042*	-0.048**
	(-0.621)	(-0.931)	(-1.124)	(-1.763)	(-2.005)
CC	0.031	0.028	0.022	0.019	0.015
	(1.489)	(1.304)	(1.107)	(1.014)	(0.927)
Constant	0.985***	0.972***	0.945***	0.931***	0.917***
	(4.821)	(4.659)	(4.431)	(4.218)	(4.009)
Observations	895	865	834	801	765
R^2	0.632	0.618	0.603	0.591	0.579
Adjusted R^2	0.615	0.602	0.587	0.575	0.561

Note: *p<0.05, **p<0.01, ***p<0.001 indicate significance at the 5%, 1%, and 0.1% levels, respectively.

The heterogeneity analysis across the UK, Germany, Singapore, Brazil, and India shows significant differences in the impact of Open Banking policies on SME financing efficiency. In the UK, shared data volume significantly increases loan approval speed (coefficient = 0.172, t = 2.193, $p < 0.01$), and API response time also has a positive effect on loan approval (coefficient = 0.083, $p < 0.05$). Additionally, API uptime significantly reduces the loan default rate (coefficient = -0.231, $p < 0.01$), indicating that platform stability is crucial in reducing default risk. In Germany, both shared data volume and API response time have significant positive effects on financing efficiency, and API uptime's negative effect on the default rate is also significant (coefficient = -0.187, $p < 0.01$), further confirming the importance of platform stability in reducing default risks.

In Singapore, shared data volume (coefficient = 0.345, t = 3.234, $p < 0.001$) and API response time (coefficient = 0.126, t = 2.431, $p < 0.01$) have particularly strong effects on financing efficiency, though the negative effect of API uptime on the default rate is not statistically significant, though the trend persists. In Brazil, shared data volume significantly impacts loan approval speed (coefficient = 0.476, t = 4.271, $p < 0.001$), showing that Open Banking's enhancements in data sharing and technology have greatly improved financing efficiency in the country, despite the weaker effect of API uptime. In India, Open Banking policies have the most significant impact on financing efficiency, with both shared data volume and API response time significantly improving loan approval speed. Although the effect of API uptime on the default rate is not significant, it still plays a potential role in reducing financing risks.

Conclusion

This study conducted a cross-country comparative analysis of the impact of Open Banking policies on SME financing efficiency, focusing on five representative countries: the United Kingdom, Germany (representing the EU), Singapore, Brazil, and India. The empirical analysis reveals that Open Banking policies, through shared data volume, API response time, and API uptime, significantly affect SME loan approval speed, loan cost, rejection rate, and loan default rate. The country-specific analysis yields the following key findings:

- Open Banking policies in the UK and Germany are more mature, particularly in reducing loan default rates. Shared data volume and API response time significantly improve loan approval speed, while API uptime is particularly important in reducing loan default rates. This indicates that platform stability plays a crucial role in reducing credit risk and enhancing SME financing efficiency.
- In Singapore and Brazil, Open Banking policies have focused more on enhancing data sharing and API response time, which have significantly improved loan approval speed. However, due to the different stages of financial market development, the effect of API technology on the default rate was not significant in these countries. Brazil's lower loan costs and faster loan approval speeds suggest that Open Banking policies are key to improving financial efficiency in developing markets.
- India's Open Banking policies have the most significant effect on SME financing efficiency. Increased data sharing and improved API response time have substantially accelerated loan approval speed, indicating that the application of fintech in India has had a notably positive impact. Although API uptime's effect on the default rate was not significant, India's technological infrastructure development provides a solid foundation for further optimizing Open Banking policies.

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