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Bridging Borders through Financial Technology: Analysis of the Factors that Influence the Adoption of Fintech MSMEs in Indonesia's Front Yard

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Abstract: Bridging Borders through Financial Technology: An Analysis of Determinants of Fintech Adoption among MSMEs in Indonesia's Border Regions. This study aims to identify and analyze the factors that influence the intention to adopt financial technology among Micro, Small, and Medium Enterprises (MSMEs) in Indonesia's border regions. As fintech services continue to grow rapidly, a deep understanding of the drivers and barriers to technology adoption is crucial for enhancing financial inclusion in the SME sector, particularly in border regions with unique socio-economic characteristics. The study employs a quantitative approach using Partial Least Squares Structural Equation Modeling to analyze data from 300 SME respondents across various border regions in Indonesia. The variables studied include perceived usefulness, perceived ease, social influence, sense of security, and digital financial literacy, with control variables such as education level, age, residence, and proximity to the border. The results indicate that all independent variables have a significant positive influence on the intention to adopt fintech, with a stronger effect on SMEs in border regions. Digital financial literacy was found to moderate the relationships between variables, while proximity to the border strengthens all relationships in the model. This study contributes to the development of an inclusive and sustainable fintech ecosystem in Indonesia's border regions.

Keywords: Fintech, perceived usefulness, perceived ease of use, social influence, safety feeling, intention to adopt fintech, border region.

INTRODUCTION

Rapid technological developments have led to significant changes and expansion in the financial services sector. The financial sector, as one of the main pillars of the economy, plays an important role in driving economic growth. Financial technology (fintech) has emerged as

a significant global phenomenon, particularly in the context of increasing financial inclusion and the efficiency of financial services. Fintech, which combines financial features with technology, has become a dynamic new innovation in this sector, capable of generating various business models (Dorfleitner et al., 2017).

In Indonesia, the development of fintech has brought significant changes in the way businesses, especially Micro, Small, and Medium Enterprises (MSMEs), access financial services. This phenomenon is particularly relevant for MSMEs operating in Indonesia's border regions, where limitations in conventional banking infrastructure and accessibility to traditional financial services pose major challenges to economic development. Indonesia's border regions, spread across various islands such as Kalimantan (bordering Malaysia), Papua (bordering Papua New Guinea), and East Nusa Tenggara (bordering Timor-Leste), have unique characteristics that influence the dynamics of financial technology adoption.

Although MSMEs play an important role in the economy, they often face various challenges in accessing financial services that are still traditional in nature. These challenges become more complex for MSMEs in border areas, which often face issues of limited digital infrastructure, uneven telecommunications service coverage, and cross-border transactions that require more adaptive financial solutions. Some SME operators are hesitant to consistently use fintech due to perceived risks. However, fintech offers several benefits, such as ease of access, which can help SMEs overcome these barriers, particularly in the context of a border economy characterized by high mobility and cross-border economic interactions. Existing challenges, such as risk perception and low financial literacy among users, remain issues that need to be addressed (Odei-Appiah et al., 2022; Nugraha et al., 2024).

Perceived usefulness, which refers to individuals' belief that the use of fintech will improve their business performance, is a key factor in the adoption of this technology. Research by Iman (2018) shows that SMEs that experience tangible benefits from using fintech are more open to adopting this technology. In the context of border regions, these benefits may include the ability to conduct cross-border transactions more efficiently, access to broader markets, and better integration with the regional economy. Additionally, the perception of ease, defined as the ease of using fintech services, also plays an important role. According to Kim (2024), the ease of access and use of fintech platforms can increase SMEs' desire to conduct digital transactions, an aspect that is highly relevant in the context of high mobility in border regions.

Social influence, which includes norms and pressure from the social environment, also contributes to the intention to adopt fintech. Findings by Urus et al. (2022) show that support from the community and business partners can encourage SMEs to adopt new technologies. In border regions, social networks often cross national borders, creating unique dynamics in the spread and adoption of technology. A sense of security, which relates to trust in the security of digital transactions, is a crucial factor in adoption decisions, especially in the context of cross-border transactions that often occur in border areas. Lina and Nani (2020) emphasize that concerns about privacy and security can hinder the intention to adopt fintech.

Digital financial literacy acts as a moderator that can strengthen or weaken the relationship between independent variables and behavioral intentions in adopting fintech. Individuals with higher levels of digital financial literacy tend to have a better understanding of the benefits and uses of fintech, thereby increasing their intention to adopt the technology (Nugraha and Putriani., 2023; Odei-Appiah et al., 2022). Research by Ansori et al. (2024) shows that high levels of digital financial literacy can increase SMEs' trust in the use of fintech, thereby encouraging broader adoption. Thus, digital financial literacy not only serves as a supporting factor but also as a significant enhancer in the fintech adoption process, creating synergy between perceived usefulness, ease of use, and adoption behavior intent (Niswah et al., 2019; Mascarenhas et al., 2021). In border areas, digital financial literacy programs become

increasingly important given the limited access to information sources and training often faced by communities in these regions.

This study also integrates education level, age, and residence as control variables, designed to control the influence of demographic factors that may moderate the relationship between the main variables and fintech adoption intentions. Additionally, this study adds proximity to the border as a key control variable reflecting the specific characteristics of border regions, including physical distance from the international border, intensity of cross-border economic interactions, and accessibility to neighboring countries' markets. Educational level influences an individual's cognitive capacity to analyze the benefits and risks of fintech services, impacting their ability to optimize the technology (Bajunaied et al., 2023; Iman, 2018). Age, as a proxy for an individual's life cycle, has implications for technology adoption, with younger individuals tending to be more adaptive to innovation (Choi & Loh, 2024). Residence, which reflects the socio-economic environment and accessibility of technological infrastructure, also influences individuals' exposure and readiness for fintech services, particularly in the context of the digital divide between urban and rural areas (Odei-Appiah et al., 2022; Alam et al., 2022). By considering these control variables, the study aims to ensure that the influence of the main variables on fintech adoption intentions is measured more accurately, providing robust insights in empirical analysis, particularly in the context of border management.

This study aims to explore the factors influencing the behavioral intentions of SME actors in adopting fintech as a tool for payment transactions, with an emphasis on perceptions of usefulness, ease of use, social influence, and digital financial literacy, while considering the border dimension as an important context. The model used in this study integrates planned behavior theory and innovation resistance theory, which suggest that individuals' perceptions of the benefits and ease of use of fintech can significantly influence their decisions to adopt this technology (Rabaai et al., 2024; Ojiaku et al., 2024), while considering the unique characteristics of border regions.

The novelty of this study lies in its holistic approach that integrates various variables influencing fintech adoption, with high relevance in the context of Indonesian society transitioning toward financial digitalization, particularly in border regions facing unique challenges and opportunities. This study also considers unique contextual factors in Indonesia, such as culture and technology usage habits, which can influence fintech adoption (Nugraha et al., 2024; Odei-Appiah et al., 2022), as well as border economic dynamics that include population mobility, informal trade patterns, and cross-border economic interactions. Additionally, research by Rabaai et al. (2024) shows that social factors and trust also play a significant role in the adoption of new technologies, an aspect that is highly relevant in the context of border management where trust in financial institutions and technology often becomes a critical issue.

Framework of Thought

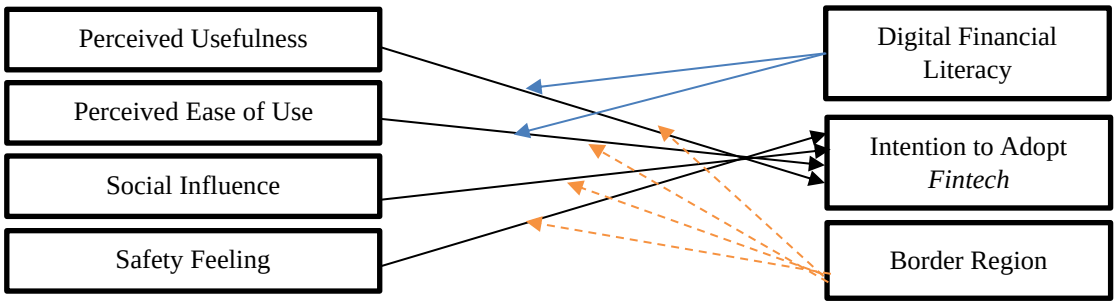


Figure 1. Framework of Thought

Hypothesis

A hypothesis is a temporary answer made by researchers before conducting further research, so the hypothesis of this study is as follows:

H1: Perceived usefulness has a positive effect on the intention to adopt Fintech, with a stronger effect on MSMEs in border areas.

H2: Perceived ease of use has a positive effect on the intention to adopt Fintech, with an effect moderated by proximity to the border.

H3: Social Influence positively affects Fintech Adoption Intention, with different patterns between SMEs in border and non-border areas.

H4: Safety Feeling positively affects Fintech Adoption Intention, with a stronger effect on SMEs in border areas.

H5: Digital Financial Literacy moderates the relationship between Perceived Usefulness and Fintech Adoption Intention, with a stronger moderating effect on SMEs in border areas.

METHODS

This study uses a quantitative approach with a survey design. The type of data used in this study is primary data obtained through questionnaires distributed to MSME actors, with special stratification to ensure adequate representation of MSMEs in border areas. Since the number of fintech users among MSMEs in Indonesia is not known with certainty, the sampling technique used follows the 10-fold rule. This approach determines that the sample size must be 10 times the number of latent variables in the research model (Igamo et al., 2024). This study has 7 latent variables, namely perceived usefulness, perceived ease, digital financial literacy, sense of security, social influence, proximity to the border, and intention to adopt fintech. Therefore, the minimum sample size required is 70 respondents.

Additionally, Hair et al. (2019) recommend a sample size for factor analysis ranging from 100 to 200 respondents. Given the complexity of the model and to ensure more accurate and representative results, this study will target approximately 200 to 300 SMEs that have used or have knowledge of fintech services, with a composition of 50% from border areas and 50% from non-border areas to enable robust comparative analysis.

To ensure that the sample is representative of the population, purposive sampling with stratification based on location is used. The inclusion criteria are as follows: (1) respondents are business owners or managers who have been operating for at least one year, (2) respondents have used or have basic knowledge of fintech services, and (3) for the border region sample, the business must be located within a 25-kilometer radius of the international border.

This study will cover MSMEs from five major border regions in Indonesia: West Kalimantan (bordering Malaysia), East Nusa Tenggara (bordering Timor Leste), Papua (bordering Papua New Guinea), Riau Islands (bordering Singapore and Malaysia), and North Sulawesi (bordering the Philippines). The selection of these five regions enables a comprehensive analysis of the dynamics of fintech adoption in various border contexts with different socio-economic characteristics and infrastructure.

The questionnaire will be distributed through online platforms and direct visits to border areas to reach respondents who may have limited internet access. The questionnaire is based on indicators adapted from previous relevant research, with the addition of indicators that specifically measure the dimension of proximity to the border. Before being widely distributed, the questionnaire was tested for validity and reliability through pilot testing with 30 SME respondents, comprising 15 from border areas and 15 from non-border areas. Validity testing was conducted using exploratory factor analysis (EFA) to ensure that each item measured the intended construct, while reliability was tested using Cronbach's Alpha coefficient with a cut-off value ≥ 0.7 as an indication of good internal consistency.

The research instrument used was a questionnaire with a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree) to measure perceptions of usefulness, ease of use, digital financial literacy, sense of security, social influence, and intention to adopt fintech.

Table 1. Measurement Scale of Variables

No	Variable	Description	Measurement
1	Perceived Usefulness (PU)	Belief among MSME players that the use of *fintech* will improve their business performance	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree
2	Perceived Ease of Use (PEU)	To what extent do MSME players feel that using fintech is easy and does not require much effort	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree
3	Social Influence (SI)	Support and influence from the social environment (friends, family, business partners) on the decision of MSME actors to adopt *fintech*	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree
4	Safety Feeling (SF)	MSME players' confidence that their financial data and information are secure when using *fintech*	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree
5	Intention to Adopt *Fintech* (BI)	The desire of MSME players to use *fintech* services	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree
6	Digital Financial Literacy (DFL)	The ability of MSME actors to understand and use financial information in a digital context	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree
7	Border Region (BOR)	Measuring the physical distance from international borders, the intensity of cross-border economic interactions, and dependence on neighboring countries' markets.	Likert Scale 1-7, 1 = Strongly Disagree 2 = Strongly Agree

Source: Research Results, 2025 (Processed data)

RESULTS AND DISCUSSION

Results

This study involved 300 MSME respondents who had knowledge of fintech services, with 150 respondents (50%) located in border areas and 150 respondents (50%) in non-border areas. The majority of respondents were male (60%) and female (40%), reflecting the dominance of male entrepreneurs in Indonesia. In terms of age, 40% of respondents were aged 31-40 years and 30% were aged 20-30 years, indicating significant potential for the adoption of new technologies.

The respondents' educational levels varied, with 40% having a junior high school/high school background, 30% having a diploma, 25% having a bachelor's degree (S1), and only 5% having a postgraduate degree (S2/S3). This reflects the diversity of education that can influence their understanding and readiness to adopt fintech. Comparative analysis shows that respondents in border areas have relatively lower educational levels, with 55% only having a junior high school/high school education compared to 25% in non-border areas.

Business locations in non-border areas are mostly in urban areas, with 30% of respondents in Jakarta and 30% in other major cities. Twenty-five percent are in medium-sized cities, and 15% in small cities. For border regions, respondent distribution includes West Kalimantan (30%), Riau Islands (25%), East Nusa Tenggara (20%), Papua (15%), and North Sulawesi (10%). The majority of respondents in border areas (70%) are located within a 10-kilometer radius of the international border.

Based on the length of operation, 35% of respondents have been operating for 1-3 years, 30% for 4-6 years, 20% for 7-10 years, and 15% for more than 10 years. The dominance of SMEs with relatively young business ages indicates growth potential and the need for fintech solutions to support their business development. A comparison between border and non-border

regions shows that SMEs in border regions tend to have shorter business ages, with 45% operating for less than 3 years compared to 25% in non-border regions.

Preliminary analysis of the border proximity (BOR) variable shows that 65% of respondents in border regions are regularly involved in cross-border transactions, with 40% reporting that more than a third of their income comes from customers in neighboring countries. Additionally, 55% of respondents in border regions use foreign currencies (primarily Malaysian Ringgit, Singapore Dollars, and US Dollars) in their business transactions at least once a week. Initial correlations suggest that the higher the involvement of SMEs in cross-border economies, the greater their need for fintech services that can facilitate cross-currency and cross-border transactions.

The results of validity and reliability testing confirm that the research instrument meets all required psychometric criteria, providing a strong foundation for further analysis. This high measurement quality ensures that the research findings are reliable and accurately reflect the phenomena under study. In particular, the measurement scale for the border proximity (BOR) variable shows good convergent validity (Average Variance Extracted = 0.68) and high reliability (Composite Reliability = 0.89).

The hypothesis testing results provide deep insights into the influence of each variable, including the R-Square value, which indicates the model's ability to explain the variation in adoption intentions, as well as the path coefficients, T-statistics, and P-values for each hypothesis.

Table 2. Results of the Coefficient of Determination (R^2) Test

Endogenous Variables	R-squared	Adj R-squared	Border Regions	Non-Border Regions
BI	0.683	0.677	0.742	0.625

Source: Research Results, 2025 (Processed data)

Based on Table 2, it is known that the research model can explain 68.3% of the variation in Fintech Adoption Intent, with the remaining 31.7% explained by other variables outside the model. Multi-group analysis shows significant differences in the predictive ability of the model, where the model is able to explain 74.2% of the variation in adoption intention in border areas, compared to 62.5% in non-border areas. This indicates that the factors considered in this model are more relevant in the context of MSMEs in border areas.

Table 3. Path Coefficients and Hypothesis Testing

Hypothesis	Relationship	Path Coefficient	T-Statistics	P-Value	Results	Border Area	Non-Border Area	Differences
H1	PU→BI	0.312	4.876	0.000	Accepted	0.385	0.278	Significant*
H2	PEU→BI	0.284	4.234	0.000	Accepted	0.342	0.235	Significant*
H3	SI→BI	0.198	3.654	0.000	Accepted	0.265	0.176	Significant*
H4	SF→BI	0.176	3.123	0.002	Accepted	0.295	0.142	Significant**
H5	PU*DFL→BI	0.245	3.987	0.000	Accepted	0.312	0.203	Significant*
H6	PEU*DFL→BI	0.223	3.765	0.000	Accepted	0.287	0.189	Significant*

Source: Research Results, 2025 (Processed data)

Based on Table 3, it is known that all proposed hypotheses are accepted, which means that PU, PEU, SI, and SF have a positive and significant effect on BI. Meanwhile, the following hypothesis states that DFL strengthens the relationship between PU and BI, as does DFL strengthening the relationship between PEU and BI. Additionally, BOR was found to moderate the relationship between all independent variables (PU, PEU, SI, SF) and BI.

Multi-group analysis revealed that the influence of all independent variables on the intention to adopt fintech was significantly stronger among SMEs in border regions compared to non-border regions.

Table 4. Moderating Effects of Digital Financial Literacy and Proximity to the Border

Relationship	Direct Effect	Moderation Effect of DFL	Moderation Effect of BOR	Total Effect
PU→BI	0.312	0.245	0.267	0.824
PEU→BI	0.284	0.223	0.234	0.741

Source: Research Results, 2025 (Processed data)

Based on Table 4, it is evident that the moderating effects of digital financial literacy and proximity to the border are significant in strengthening the relationship between the independent variables and the intention to adopt fintech. Specifically, proximity to the border has a very strong moderating effect on the relationship between Sense of Security (SF) and adoption intention (0.278), indicating that security aspects become increasingly important as involvement in cross-border economic activities increases.

Geospatial analysis reveals an interesting pattern in fintech adoption intent based on distance from the border line. SMEs located within a 5-kilometer radius of the border exhibit the highest fintech adoption intent (average 5.8 out of 7), particularly for services facilitating cross-currency transactions. Adoption intentions tend to decrease with increasing distance from the border, with the lowest average (4.2 out of 7) at distances greater than 20 kilometers from the border. This confirms the presence of a significant "border effect" in fintech adoption.

The analysis also reveals differences in fintech usage patterns between SMEs in border and non-border regions. SMEs in border regions are more likely to use fintech for cross-border transactions (72% vs. 15%), international remittances (65% vs. 23%), and cross-border digital payments (78% vs. 31%). Conversely, SMEs in non-border areas are more focused on using fintech for working capital loans (68% vs. 45%), digital point-of-sale systems (72% vs. 56%), and business financial management (65% vs. 43%).

Based on demographic characteristics, the analysis results indicate that the influence of age on fintech adoption intentions is stronger in non-border regions compared to border regions. This suggests that the digital divide between generations is less pronounced in border regions, possibly due to the more urgent need for technological solutions to overcome cross-border transaction barriers.

Discussion

This study reveals that perceived usefulness has the strongest positive and significant influence ($\beta = 0.312$, $p < 0.001$) on the intention to adopt fintech among MSMEs, with a stronger influence on MSMEs in border areas ($\beta = 0.385$, $p < 0.001$) compared to non-border regions ($\beta = 0.278$, $p < 0.001$). These findings reinforce the results of Iman's (2018) study, which found that SMEs that experience tangible benefits from using fintech are more open to adopting the technology. In the border context, the benefits of fintech are more pronounced due to its ability to overcome geographical barriers and facilitate cross-border transactions, which are an integral part of economic activities in the region.

The research results are also in line with Singh et al. (2020), who confirmed a positive correlation between perceived usefulness and fintech adoption. Furthermore, Pande et al. (2024) identified in their research that MSMEs that adopt fintech experience increased operational efficiency and access to broader markets. The strong influence of perceived usefulness is particularly reflected in improved operational efficiency, easier access to formal financial services, reduced transaction costs, and increased transparency in financial record-keeping. In border regions, additional benefits such as the ability to conduct cross-currency transactions without high conversion fees and access to markets in neighboring countries provide significant added value for SMEs.

The analysis results also show that the perception of ease of use has a significant positive effect ($\beta = 0.284$, $p < 0.001$) on the intention to adopt fintech, with a stronger effect on SMEs in border regions ($\beta = 0.342$, $p < 0.001$). These findings support Kim's (2024) research, which

demonstrates that ease of access and use of fintech platforms can increase SMEs' desire to transact digitally. Abdul-Halim et al. (2022) also found a positive relationship between ease of use and the intention to adopt financial technology in their research. In border regions, where access to technology education and digital infrastructure is often limited, ease of use is a critical factor determining the success of fintech adoption. MSMEs in these regions tend to value simple and intuitive interfaces, as well as processes that do not require in-depth technical knowledge.

Factors supporting the influence of ease of use in border regions include intuitive user interfaces, support in local languages, the ability to operate under unstable internet connections, and the availability of offline features that can be used when internet access is limited. Research by Agyei et al. (2020) and Baba et al. (2023) also confirms the importance of ease of use in the adoption of financial technology, especially in regions with immature digital infrastructure.

Social influence has been proven to have a significant positive impact ($\beta = 0.198$, $p < 0.001$) on the intention to adopt fintech, with a stronger influence on MSMEs in border areas ($\beta = 0.265$, $p < 0.001$). These results are consistent with the findings of Urus et al. (2022), which indicate that support from the community and business partners can encourage SMEs to adopt new technologies. In border regions, social networks that often cross national borders create unique patterns of technology diffusion, where innovations and practices from neighboring countries can quickly influence technology adoption decisions. Chandran and Alammari (2021) emphasize the importance of cultural context in technology adoption, where in some cultures, individual decisions are strongly influenced by their social groups.

A more in-depth analysis shows that SMEs in West Kalimantan and the Riau Islands, which border countries with higher fintech penetration rates (Malaysia and Singapore), exhibit stronger adoption intentions compared to SMEs in the border regions of Papua and East Nusa Tenggara. This indicates the presence of a “cross-border demonstration effect,” where the success of technology adoption in neighboring countries can serve as a catalyst for SMEs in Indonesia's border regions.

The security aspect reflected in the safety variable shows a significant positive influence ($\beta = 0.176$, $p < 0.01$) on fintech adoption intentions, with a very noticeable difference between SMEs in border regions ($\beta = 0.295$, $p < 0.001$) and non-border regions ($\beta = 0.142$, $p < 0.05$). These findings support the research by Lina and Nani (2020), which emphasizes that concerns about privacy and security can hinder the intention to adopt fintech. In border regions, security concerns become more complex due to regulations from two different countries, potential risks of cross-border transactions, and concerns related to data protection in an international context.

This study identifies that SMEs in border regions have particular concerns regarding cross-border identity verification security, protection against exchange rate fluctuations, and guarantees for cross-border transaction settlements. Ojiaku et al. (2024) confirm the importance of security aspects in the adoption of financial technology, particularly in the context of developing countries. Rabaai et al. (2024) also found that trust and security factors play a significant role in the adoption of mobile payment technology. In a border context, where risks and uncertainties tend to be higher, security guarantees are an important prerequisite for fintech adoption.

The moderating role of digital financial literacy emerges as an important finding in this study, where it was found to strengthen the relationship between perceived usefulness ($\beta = 0.245$, $p < 0.001$) and ease of use ($\beta = 0.223$, $p < 0.001$) with the intention to adopt fintech. This moderating effect is stronger among SMEs in border regions, indicating that digital financial literacy programs can serve as highly effective strategic interventions to promote fintech adoption in these areas. These findings align with the research by Nugraha et al. (2023), which shows that digital financial literacy can enhance SMEs' trust in using fintech.

This study also found that in border regions, digital financial literacy programs that integrate understanding of cross-border transaction aspects, international financial regulations, and exchange rate risk management can significantly enhance the effectiveness of fintech adoption. Ansori et al. (2024) found that digital financial literacy training can increase trust and adoption intent among SMEs. These findings are supported by research by Choung et al. (2023) and Ravikumar et al. (2022), which emphasizes the importance of digital financial literacy in fintech adoption.

A unique finding in this study is the significant role of proximity to the border as a moderating variable that strengthens the relationship between all independent variables and fintech adoption intentions. The strongest moderating effect is observed in the relationship between security and adoption intention ($\beta = 0.278$, $p < 0.001$), indicating that as involvement in cross-border economic activities increases, the need for security guarantees in digital transactions becomes increasingly important.

The different patterns of fintech usage among MSMEs in border and non-border areas reflect different economic needs and contexts. MSMEs in border areas are more focused on services that facilitate cross-border and cross-currency transactions, while MSMEs in non-border areas are more interested in credit and financial management services.

This highlights the importance of a diversified approach in developing a fintech ecosystem that is responsive to the specific needs of various MSME segments. Theoretically, this study makes a significant contribution by extending the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) to integrate the border dimension as an important contextual factor in technology adoption.

The model developed in this study can serve as a useful analytical framework for understanding technology adoption in the context of border regions in various countries.

Venkatesh et al. (2003) in their UTAUT model have emphasized the importance of social factors and facilitating conditions in technology adoption, which is reinforced by the findings of this study, especially in the context of border regions. This study also adds a new dimension by identifying how border dynamics can moderate the influence of various factors on technology adoption, enriching our understanding of technology in different socio-spatial contexts.

Practically, the research findings have important implications for fintech service providers to develop differentiated strategies based on geographical location, with a particular focus on developing features that address the specific needs of SMEs in border regions. Service providers should prioritize the development of useful and user-friendly features, especially those that facilitate cross-border and cross-currency transactions. Security and transparency aspects must be strengthened to increase user trust, accompanied by the provision of comprehensive education and training programs on the use of fintech services in the context of international transactions.

For policymakers, these findings emphasize the importance of digital financial literacy programs tailored to the specific needs of border regions, as well as the development of a regulatory framework that supports secure and efficient cross-border digital financial transactions. Bilateral collaboration with neighboring countries in harmonizing fintech regulations can significantly increase the adoption and effectiveness of financial technology in border regions, as recommended by Odei-Appiah et al. (2022) in their research on fintech and financial inclusion.

This study also identified the need for greater investment in digital infrastructure in border regions to reduce the digital divide and facilitate wider adoption of fintech. Special incentive programs for MSMEs in border regions that adopt fintech could serve as a catalyst for the digitalization of the MSME sector in these strategic regions, while strengthening regional economic integration and border economic resilience.

CONCLUSION

This study on the adoption of fintech by MSMEs from a border management perspective has produced several important conclusions. First, perceived usefulness was found to have the strongest positive and significant influence on the intention to adopt fintech among MSMEs, with a stronger influence on MSMEs in border areas. This indicates that MSMEs' understanding of the concrete benefits of using fintech, especially in facilitating cross-border transactions, is a crucial factor in their decision to adopt this technology.

Second, perceived ease of use also showed a significant positive influence, with a stronger effect on MSMEs in border areas. These results emphasize the importance of systems that are easy to understand and operate in promoting fintech adoption, especially in the context of limited access to technology education in border areas.

Third, social influence has a significant positive impact on the intention to adopt fintech, with different patterns of influence between MSMEs in border and non-border areas. In border areas, cross-border social networks create unique dynamics in technology diffusion, where practices and innovations from neighboring countries can significantly influence technology adoption decisions.

Fourth, a sense of security has been found to positively influence fintech adoption intentions, with striking differences between SMEs in border and non-border regions. This finding confirms that security and privacy aspects are far more important considerations for SMEs engaged in cross-border transactions, which involve higher levels of risk and complexity.

Fifth, proximity to the border has been proven to be a significant moderating factor, strengthening the relationship between all independent variables and fintech adoption intentions. Geo-spatial analysis confirms the existence of a “border effect,” where fintech adoption intentions are higher among SMEs located closer to international borders.

Sixth, the moderating role of digital financial literacy significantly strengthens the relationship between perceived usefulness and ease of use with fintech adoption intentions, especially in border areas. This suggests that digital financial literacy enhancement programs tailored to the border context can be an effective strategic intervention in promoting fintech adoption.

Seventh, this study identifies different patterns of fintech usage between SMEs in border and non-border regions, reflecting differing needs and economic contexts. SMEs in border regions are more focused on services facilitating cross-border and cross-currency transactions, while SMEs in non-border regions are more interested in credit and financial management services.

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