A Comprehensive Study of MFI Performance, Credit Default Risk, and Fintech Adoption: To Improve Efficiency, Stability, and Social Impact of MFI for Financial Inclusion in Laos

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Abbreviations:

AFP-VF	Access to Finance for the Poor-Village Fund
AI	Artificial Intelligence
ASEAN	Association of Southeast Asian Nations
ATM	Automated Teller Machine
AVE	Average Variance Extracted
BCEL	BANQUE POUR LE COMMERCE EXTERIEUR LAO PUBLIC
BOL	Bank of the Lao People's Democratic Republic
CAR	Capital Adequacy Ratio
CAMELs	Capital Asset Management Earning Liquidity Sensitivity
CBDC	Central Bank Digital Currency
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
DTMFI	Deposit-taking Microfinance Institution
EFA	Exploratory Factor Analysis
FA	Fixed Assets
Fintech	Financial Technology
FIRM	Financial Inclusion Roadmap
FISD	Financial Institution Supervision Department
GDP	Gross Domestic Product
GFI	Goodness-of-Fit Index
GIZ-AFP	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH-Access to Finance for the Poor

GNI	Gross National Income
GOV	Government
GS	Government Support
ICT	Information and Communication Technologies
INT	Intention
IPMA	Interaction- and Polynomial-Based Model Analysis
LaPASS	Lao Payment and Settlement System
LDC	Less Developed Country
LMFA	Lao Microfinance Association
LSB	Lao Statistic Bureau
LWU	Lao Woman Union
MAP	Making Access Possible
MD	Managing Director
MFI	Microfinance Institution
ML	Machine Leaning
NDTMFI	Non-deposit Taking Microfinance Institution
NFI	Normed Fit Index
NGO	Non-Government Organization
OE	Operational Efficiency
PAR	Portfolio at Risk
PEU	Perceived Ease of Use
PLS-POS	Partial Least Squares-Path Modeling
PR	Perceived Risk
PU	Perceived Usefulness
REG	Regulation

RMSEA	Root Mean Square Error of Approximation
ROA	Return on Assets
ROE	Return on Equity
SEM	Structured Equation Modeling
SG	Saving Group
TAM	Technology Acceptance Model
TLI	Tucker-Lewis Index
TRA	Theory of Reasoned Action
UN	United Nations
UNCDF	United Nations Capital Development Fund
UTAUT	Unified Theory of Technology Acceptance and Use of Technology
VB	Village Bank
VDF	Village Development Fund
WECP	Women's Empowerment in Communities Project
WO	Write-Off

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I take full responsibility for any errors that may be present in this dissertation.

Abstract

This dissertation aims to explore the adoption of fintech to improve the efficiency, stability, and social impact of microfinance institutions (MFIs) for financial inclusion in Laos. In Chapter 2, we delve into the current state of financial inclusion in Laos and identify the primary barriers and challenges obstructing its progress. Additionally, we analyze the role of MFIs in advancing financial inclusion within the country. In Chapter 3, we examine MFIs' performance and credit default risk using CAMEL rating systems, allowing us to gain a comprehensive understanding of their financial health when extending loans to underserved populations. The findings highlight the importance of MFIs' risk management and financial stability in advancing greater financial inclusion.

Chapter 4 concentrates on the role of fintech, exploring its potential benefits and risks for enhancing the efficiency, stability, and social impact of MFIs in promoting financial inclusion in Laos. This study establishes the groundwork for fostering more inclusive and sustainable financial practices in the country. Furthermore, it emphasizes the necessity of addressing fintech-related risks as well as balancing the relationship and transaction banking to fully maximize its potential for MFIs seeking to enhance their efficiency, stability, and social impact through fintech adoption.

To understand the factors that affect fintech adoption in MFIs, we develop a theoretical model in Chapter 5 by extending the Technology Acceptance Model (TAM) with perceived risk, government support, and regulation. Surveying managing directors from MFIs provides useful data, and the effectiveness of the extended TAM is validated through Structured Equation Modeling (SEM). This study contributes to theoretical development by enriching TAM with additional variables. Applied this extended model in the context of MFIs in Laos, it provides a more comprehensive understanding of fintech adoption, strengthening TAM's credibility, and contributing to a robust theoretical framework for fintech adoption within the scope of MFIs. Consequently, our study provides practical guidance for practitioners seeking to strengthen influential factors and overcome obstacles in the fintech adoption of MFIs.

Through an examination of the situation of financial inclusion in Laos, the role of MFIs in driving financial inclusion, their performance, credit default risk, and fintech adoption, this dissertation demonstrates the potential of fintech and its role in improving the efficiency, stability, and social impact of MFIs for financial inclusion in Laos. Ultimately, it may contribute to the advancement of the country's financial ecosystem and support societal progress.

Chapter 1. Introduction

1.1. Overview

Financial inclusion refers to granting access to a range of formal financial products and services to everyone (Sarma 2008; Hannig and Jansen 2010; Sarma and Pais 2011; Kim et al. 2018). It involves addressing financial exclusion, which refers to the limited availability of formal financial services (Sinclair 2001; Dev 2006; Allen et al. 2016; Ozili 2018). Recent years have provided growing evidence of the substantial societal benefits of financial inclusion. It is a vital tool against poverty (Honohan 2008; Chibba 2009; Bruhn and Love 2014), reducing income inequality (Turegano and Herrero 2018; Neaime and Gaysset 2018), ensuring financial stability (Hannig and Jansen 2010; Cull, Demirgüç-Kunt, and Lyman 2012; Ahamed and Mallick 2019), and fostering economic growth (Mohan 2006; Mader 2018; Kim et al. 2018).

Financial exclusion is a global issue, impacting an estimated 2.3 billion working-age adults who lack accounts with formal financial institutions (Atkinson and Messy 2013). This challenge is not new; historically, there has always been a segment of the population with limited access to a wide range of financial services (Kempson and Whyley 1999). This persistent problem disproportionately affects impoverished individuals, leaving a substantial portion of them without access to crucial financial services like credit, insurance, bill payments, and deposit accounts (Carbo, Gardener, and Molyneux 2007). The limited access to financial services makes it difficult for these households to save, plan for the future, seize economic opportunities, and address unexpected financial crises. In addition, it hampers their ability to invest in education, purchase homes, and pursue other avenues for wealth accumulation. Consequently, the absence of mainstream financial services has widespread consequences,

including reduced income, diminished effectiveness of government assistance programs, and barriers to long-term investments (Barr 2004).

In Laos, addressing financial exclusion is a significant challenge, with a substantial portion of the population lacking access to basic financial services. Only 47% of adults have access to formal financial services, indicating a low level of financial inclusion (FinMark Trust 2014). Efforts to expand financial inclusion are crucial, as emphasized by the development of a financial inclusion roadmap (FIRM). However, despite these efforts, banks have shown limited commitment to expanding their networks and offering innovative products to individuals with low incomes (FinMark Trust 2016). An assessment of the progress made after implementing the FIRM plan reveals varying levels of advancement across different priority areas. Unfortunately, none of the planned activities have been completed, with some still in progress (UNCDF 2021).

Another significant problem in promoting financial inclusion in Laos is the limited effectiveness of informal finance options such as village funds (VFs). Despite the government's efforts to address these issues, progress has been slow, leaving many planned activities unaccomplished. Several factors contribute to these challenges. The implementation of proposed government activities may be affected by obstacles such as insufficient resources and inadequate training. Additionally, the complexities of VFs' problems such as operational limitations, governance issues, and financial knowledge gaps may impede progress.

As a result, when it comes to advancing financial inclusion in Laos, microfinance institutions (MFIs) excel over VFs due to their more robust management, adherence to regulations, and capacity to deliver reliable services. Moreover, MFIs represent a superior option for promoting financial inclusion when compared to commercial banks. They reach

underserved populations, provide simple services, and remain accessible to those who have been excluded from the formal financial sector.

MFIs have significantly contributed to promoting financial inclusion in Laos by offering financial services to the unbanked poor. Numerous empirical studies have showcased the positive effects of MFI-based financial inclusion in reducing poverty (Morduch 1999; Quinones Jr. and Seibel 2000; Morduch and Haley 2002; Khandker 2005; Mahjabeen 2008; Imai et al. 2012), income inequality (Hashemi et al. 1996; Mahjabeen 2008; Hermes 2014), and social impact (Cheston and Kuhn 2002; DeLoach and Lamanna 2011; Hamdani and Naeem 2012; Louis et al. 2013).

The rapid expansion of MFIs in Laos illustrates the growing demand for their services and access to formal finance. MFIs have surpassed commercial banks in terms of deposits and credit, with a 720% increase in deposits and a 637% increase in credit. The number of MFIs has also increased by 173%, showing their critical role in advancing financial inclusion for marginalized and low-income populations. However, the rapid growth of MFIs in Laos raises potential risks to their performance, particularly credit defaults when serving vulnerable groups excluded from the formal financial system.

Efforts have been made to enhance the efficiency and stability of MFIs in Laos. These efforts involve government intervention measures, strengthened regulatory oversight, and a focus on improving loan quality to reduce credit risk. Nonetheless, MFIs in Laos continue to face performance challenges, particularly high operational costs, which limit their ability to provide affordable financial services. They also face credit-default concerns when serving low-income individuals who are excluded from the formal financial sector. As a result, it is critical to prioritize enhancing MFI performance and reducing credit default risk to ensure stability, depositor security, and long-term support for financial inclusion.

Addressing this challenge, MFIs can embrace financial technology (fintech) to manage risk, enhance stability, and foster long-term financial inclusion (Banna et al. 2022). Fintech has emerged as a transformative force, melding finance and technology to offer innovative and convenient financial solutions driven by technological advancements (Arner, Barberis, and Buckley 2015). This encompassing trend[1] has the potential to cut costs, enhance services, and establish a robust financial ecosystem (Philippon 2019; Dubey 2019; Moro-Visconti 2021). Extensive research has shown the influence of fintech on the financial sector, illustrating its ability to improve operational efficiency (Brammertz and Mendelowitz 2018; Dubey 2019; Chen 2020; Chen et al. 2021; Hannoon et al. 2021), facilitate bank lending (Sedunov 2017; Sanchez 2018; Sheng 2021), bolster financial stability (Fung et al. 2020; Daud et al. 2022), and advance financial inclusion (Mention 2019; Tok and Heng 2022; Yeyouomo et al. 2023). While global fintech advancements have brought about transformative changes, their potential impact on MFIs in developing countries is especially important.

Fintech solutions are effectively boosting financial inclusion by positively affecting the operational management of MFIs (Ivatury 2009; Dorfleitner et al. 2013; Pytkowska and Korynski 2017; Badruddin 2017; Meyer 2019; Lee et al. 2021; Bayram, Talay, and Feridun 2022). By integrating fintech tools into their processes, MFIs gain the ability to enhance risk and cost management, as well as perform comprehensive customer data analysis. This empowers MFIs to improve their financial health and social impact (Ayayi and Sene 2010; Bumacov, Ashta, and Singh 2014; Amersdorffer et al. 2015; Wyman 2017; Badruddin 2017; Iqbal et al. 2019; Benami and Carter 2021; Ashta and Herrmann 2021; Dorfleitner, Davide, and Quynh 2022).

[1] Such as blockchain, robo-advisors and trading systems, peer-to-peer lending, equity crowdfunding, mobile payment systems, artificial intelligent (AI), and machine learning (ML).

Interestingly, none of the MFIs in Laos have currently adopted fintech. Over the past three years (2017–2019), Laos consistently ranked at the bottom among ASEAN nations in terms of fintech adoption, although there have been some gradual improvements (Huong et al. 2021). Laos has taken steps to enhance digital connectivity, witnessing increased internet usage, household internet access, and fixed-telephone subscriptions. However, the country still lags behind neighboring nations like Thailand, Vietnam, and Cambodia in the overall ICT Development Index ranking (International Telecommunication Union 2017). Laos is in the early stages of developing digital financial services. Recent collaborations between financial institutions and the Bank of the Lao PDR (BOL), the country's central bank, are focused on introducing innovative fintech solutions and driving the adoption of digital financial services. BOL, in conjunction with financial regulators from the Asia-Pacific region, is actively upgrading payment infrastructure, exploring the potential of a central bank digital currency (CBDC), and leading initiatives like the Lao Payment and Settlement System (LaPASS) and the Lao QR Code. Additionally, Laos is partnering with Malaysia to establish the Lao Digital Park and Fintech Valley, aiming to create a fintech regulatory sandbox, develop digital government applications, and foster new fintech solutions (Fintech News Singapore 2023).

Considering the large number of people in Laos who still do not have access to financial services, the growth of MFIs that play an important role in promoting social impact through financial inclusion, the challenges surrounding MFIs' performance and credit default risk, the potential benefits of fintech solutions for improving the efficiency, stability, and social impact of MFIs in Laos, and the ongoing digitalization efforts in the country, there is a compelling need to examine and pursue the following objectives:

1.2. Objectives of this dissertation

1. To understand the role of MFIs in promoting social impact through financial inclusion in Laos.
2. To examine Laotian MFIs' performance and credit default risk in order to gain a better understanding of their financial health when providing financial services to underserved and low-income populations.
3. To delve into the potential benefits and risks of fintech solutions and understand their implications for MFIs regarding fintech adoption to improve their efficiency, stability, and social impact for financial inclusion in Laos.
4. To verify the effectiveness of using the Technology Acceptance Model (TAM), incorporated with factors such as government support, perceived risk, and regulation, as a research model for examining the factors that affect fintech adoption within MFIs in Laos.
5. To inform the development of policies and strategies that promote fintech adoption, improve the efficiency and stability, and social impact of MFIs for financial inclusion in Laos.

Furthermore, in pursuit of the aforementioned objectives, this dissertation proposes the following research questions:

1.3. Research questions

1. What role do MFIs play in promoting social impact through financial inclusion in Laos?
2. How do the performance and credit default risk of MFIs in Laos impact their financial health when serving underserved and low-income populations?

3. What are the potential benefits and risks of fintech solutions, and what implications do they have for MFIs in fintech adoption to improve their efficiency, stability, and social impact for financial inclusion in Laos?
4. Can the extended TAM, incorporating government support, perceived risk, and regulation, serve as an effective research model for examining the key drivers and barriers of fintech adoption in MFIs in Laos?

Therefore, to address the outlined research questions, this dissertation aims to provide clear insights into the role of MFIs in driving social impact through financial inclusion in Chapter 2. By analyzing the current state of financial inclusion in the country, this study identifies the primary barriers and challenges impeding progress, emphasizing the crucial role played by MFIs in promoting social impact through enhanced financial access.

Furthermore, to gain a better understanding of MFIs' financial health, Chapter 3 of this dissertation examines their performance and credit default risk by using the CAMEL rating system. The findings reveal guidance for policymakers and stakeholders aiming to enhance the stability of MFIs and drive forward financial inclusion efforts. In Chapter 4, this dissertation delves into the potential benefits and risks of fintech solutions. The study emphasizes the importance of addressing fintech-related risks as well as balancing relationship and transaction banking to fully maximize the benefits for MFIs seeking to improve their efficiency, stability, and social impact through fintech adoption. This foundation lays the groundwork for more inclusive and sustainable financial practices in the country.

In Chapter 5, the research aims to develop an effective model for examining fintech adoption in MFIs within Laos. This theoretical model was created by expanding TAM and incorporating additional factors such as perceived risk, government support, and regulation. To validate the model, an empirical test was conducted using Structured Equation Modeling (SEM)

to assess its reliability and validity in predicting MFIs' intention to adopt fintech. The findings provide robust support for the extended TAM model, demonstrating its effectiveness in predicting the factors that impact MFIs' intention towards the adoption of fintech. Finally, Chapter 6 wraps up the study by discussing its implications and limitations.

Chapter 2. The role of MFI in driving social impact through financial inclusion in Laos

2.1. Background and literature reviews

Financial inclusion means giving everyone access to a variety of formal financial products and services (Sarma 2008; Hannig and Jansen 2010; Sarma and Pais 2011; Kim et al. 2018). However, some scholars define it as specifically targeting vulnerable groups who are excluded from these services (Dev 2006; Allen et al. 2016; Ozili 2018). This means financial inclusion is the process of addressing financial exclusion, which broadly refers to limited access to formal financial products and services (Sinclair 2001).

This limitation to access to formal finance can arise due to several factors, such as access problems arising from banks' risk assessment processes, geographic challenges such as the absence of bank branches in a particular area, high pricing for financial products and services, inadequate product features to meet client's needs, marketing practices that exclude certain segments of the market, and self-exclusion, where some sections of the population do not approach banks due to a belief that their requests would be denied (Panigyrakis et al. 2002; Sarma 2008; Dasgupta 2009).

Microfinance institutions (MFIs) play an important role in promoting financial inclusion, they are considerably smaller in scale, limit their services to low-income households, and frequently offer modest, unsecured group loans. MFIs offer numerous financial services to low-income households. Their global expansion has benefited the underprivileged by providing them with loans, savings products, money transfers, and insurance services. This has helped establish a favorable socioeconomic environment for many of the households in these developing nations (Mushtaq and Bruneau 2019).

Microfinance programs aim to serve underprivileged individuals who lack access to formal financial institutions. However, in some countries, MFIs offer more than just financial services. They also provide guidance on education, healthcare, sanitation, child vaccination, illness prevention, and environmental concerns (Mahjabeen 2008). MFIs have affected poor households' capacity for cooperation and mutual support in their fight against poverty (Quinones Jr. and Seibel 2000), while also directly influencing economic growth through the value that MFI performance adds to purchasing power (Lopatta and Tchikov 2016). There is evidence that microfinance can have a positive impact on the economic and social situation of clients, their households and businesses, as well as wider social and economic impacts, including changing social relationships and labor market effects (Morduch and Haley 2002).

The study conducted by Hamdani and Naeem (2012) explored the role of microfinance on social mobility. Their findings revealed a positive relationship between these two variables. The microfinance scheme was found to significantly enhance social mobility, leading to improved living standards and increased financial opportunities for individuals. Afrane (2002) covers two research studies that were carried out in Ghana and South Africa. These studies investigated the influence of microfinance interventions on different outcomes. The findings of the research reveal that microfinance interventions have had a substantial positive impact on enhancing business incomes, access to life-improving facilities, and empowerment of individuals, especially women. Microfinance has been shown to positively impact women's empowerment by reinforcing their economic roles and augmenting their ability to support their families. Hashemi, Schuler, and Riley (1996) argue that microfinance credit programs empower women by imparting experience and self-confidence to the public. Furthermore, Cheston and Kuhn (2002) provide evidence that microfinance promotes women's empowerment in terms of decision-making, asset ownership, and legal and political awareness. Although not all women

experience empowerment through microfinance, it has the potential to make a significant impact. Women profit from access to credit and other financial services, and strengthening their financial base and economic contribution to their families and communities can be a critical factor in their empowerment.

The study by Khandker (2005) also indicates that microfinance typically supports informal activities that have low market demand and returns. This implies that the overall impact of microfinance on poverty reduction may be minimal or even non-existent. Consequently, any poverty reduction observed among individual microfinance participants may simply be due to the redistribution of income or short-term income gains from the microfinance program. Nonetheless, the article examined the impact of microfinance on poverty reduction at both individual and aggregate levels in Bangladesh. The results indicate that microfinance access substantially contributes to poverty reduction, especially among female participants, and has an overall positive effect on poverty reduction at the village level. Therefore, microfinance not only assists poor individuals but also stimulates the local economy.

Furthermore, the use of microfinance is emphasized in contemporary development policies, with various benefits ranging from gender equality to economic growth. Its potential advantages include facilitating the spread of health information among parents, contributing to the development of health-related infrastructure, and assisting households in coping with unforeseen economic crises. The study conducted by DeLoach and Lamanna (2011) analyzed data from the Indonesian Family Life Survey spanning from 1993 to 2000. Their research demonstrated a notable improvement in child health within communities that had MFIs. They argued in favor of utilizing microfinance as an effective means to promote development and overall well-being. The presence of MFIs in local communities significantly and positively affects children's health by empowering women and fostering the growth of social capital.

Mahjabeen (2008) examined the impact of MFIs in Bangladesh using a general equilibrium framework based on data from 1999-2000. The findings suggest that microfinance is an effective development strategy with important policy implications for poverty reduction, income distribution, and achieving millennium development goals. The study highlights how MFIs can contribute to achieving the United Nations' eight Millennium Development Goals (MDGs), such as reducing poverty, promoting gender equality, and improving maternal health. The author argues that MFIs have a multifaceted approach that can empower the poor, particularly women, both financially and socially, leading to accelerated human development and aid in achieving the MDGs. The author also suggests that developing countries can use MFIs as a way to reach the vast majority of poor people and future generations to help achieve the MDGs.

Numerous impact studies have demonstrated that MFIs have a positive effect on society, as the vast majority of clients who utilize MFI services do benefit (Hashemi Schuler and Riley 1996; Morduch 1999; Quinones Jr. and Seibel 2000; Cheston and Kuhn 2002; Khandker 2005; Mahjabeen 2008; DeLoach and Lamanna 2011; Hamdani and Naeem 2012; Louis et al. 2013; Hossain and Khan 2016; Mushtaq and Bruneau 2019). However, there is significant evidence indicating that some clients, especially the poor may not benefit from MFIs and may even experience negative consequences. The study by Hulme (2000) examined the potential negative effects of microfinance on poor individuals. It argues that microcredit can provide opportunities for people to improve their income and reduce vulnerability, but it does not always lead to positive outcomes. Poor individuals in low-return activities, particularly in underdeveloped areas with environmental and economic risks, may struggle to repay loans due to factors beyond their control, such as illness, floods, droughts, theft, a lack of skills, knowledge, or sound decision-making. In Bangladesh, there have been cases of MFI borrowers facing arrests, threats

of violence, and even suicides due to loan repayment issues. As a result, many impoverished individuals are understandably afraid of taking on debt from MFIs. The study is not intended to discredit microfinance as there is substantial evidence that it can improve the lives of many poor people. Instead, it serves as a reminder to microfinance providers, also known as MFIs, that they need to closely monitor both positive and negative impacts, and continually strive for improvement. The microfinance industry should also recognize its limitations and strive to better understand the financial needs of impoverished individuals.

Additionally, Mayoux (2001) examined the prevalence of the financial self-sustainability paradigm in micro-finance programs, which focuses on promoting women's participation in groups to achieve financial sustainability and empowerment. The authors argue that this approach overlooks the complexities of power relations and social norms and that more attention needs to be given to the types of social capital that are encouraged and for whom. Based on evidence from seven micro-finance programs in Cameroon, the authors conclude that social capital-building programs can contribute to women's empowerment, but only if power relations and inequalities are taken into account. They warn that a narrow focus on financial self-sustainability may undermine poverty reduction and empowerment goals. The study conducted by Shaw (2004) argues that MFIs were not increasing the income of the clients in southeastern Sri Lanka. This is because those who start off with less money are often limited by geographical, financial, and sociocultural obstacles when trying to enter more profitable microenterprise occupations. Consequently, they often end up pursuing low-value activities that have little potential for growth. In arid rural areas, where microenterprises face significant market and infrastructure constraints, developing microenterprises is unlikely to be an effective means of alleviating poverty.

Despite the advantages and challenges associated with financial inclusion, Laos struggles with the critical issue of financial exclusion. The country has a unique economic and financial background, having achieved economic progress since adopting the New Economic Mechanism (NEM) as its permanent economic policy in the late 1980s. Over the 30 years from 1989 to 2018, the GDP growth averaged 7.1%, even during the Asian Financial Crisis (1997–99), while GDP-per-capita growth averaged 5.1%. In 1975, following the Second Indochina War, Laos had to rebuild its economy from scratch. In the last five years, GDP growth has averaged 4.8%, decreasing from 5.7% in 2015 to 3.1% in 2019. Although Laos aims to escape its current status as a Less Developed Country (LDC) by 2026, it achieved lower middle-income status with a GNI of USD 2,560 per capita in 2019 (UNCDF 2021). Despite this progress, a substantial portion of the population remains unbanked and lacks access to basic formal financial services (FinMark Trust 2014).

By recognizing the importance of financial inclusion for sustainable growth, poverty reduction, and macroeconomic stability (Lao PDR 2004), the government of Laos has developed a financial inclusion roadmap. This initiative aims to enhance financial access for the poor and reduce poverty in the country (FinMark Trust 2016). However, despite the efforts to promote financial inclusion, the country still encounters various barriers and challenges hindering progress in this area. These include the insufficient contribution from banks and the inefficiencies of village development funds (VDFs) or village funds (VFs). Additionally, the chronic financial and operational issues faced by the AFP-VF (Access to Finance for the Poor-Village Fund) system and Lao Woman Unions jeopardize their long-term viability and the financial security of their members (UNCDF 2021).

It has made MFIs play a crucial role in promoting financial inclusion in Laos by providing financial services to underserved populations. The rise of MFIs in Laos is evidence

of the increasing demand for their services and greater access to formal finance. In recent years, the microfinance industry has experienced significant expansion, with MFIs surpassing the growth of commercial banks. MFIs have witnessed a remarkable 720% rise in deposits and a notable 637% growth in credit. Moreover, the number of MFIs has surged by a substantial 173%, highlighting their crucial role in promoting financial inclusion for low-income and marginalized populations.

This chapter provides insights into the status of financial inclusion in Laos. It identifies the main obstacles and challenges that are impeding its advancement and emphasizes the role played by MFIs in promoting financial inclusion. In addition, it provides practical recommendations to policymakers and stakeholders to overcome the obstacles and promote greater financial inclusion in the country. The remaining sections are organized as follows: The following section presents the historical development of the Lao financial system. Section 2.3. delves into the outlook of financial inclusion in Laos. Section 2.4. discusses the contribution of banks and highlights their shortcomings in promoting financial inclusion. Section 2.5. examines the failure of VFs to support financial inclusion. Section 2.6. explores the contributions and challenges in promoting the financial inclusion of MFIs. Finally, Section 2.7. concludes the chapter by discussing its implications.

2.2. Historical development of the Lao financial system

After the prolonged civil war in Laos ended in 1975 with the Pathet Lao emerging victorious, the monarchy was abolished, and the Lao People's Democratic Republic (Lao PDR) was established on December 2, 1975. Following its establishment, the Lao PDR adopted a centrally planned economy, marked by a high degree of centralized economic decisions, strict control, and limited reliance on market forces. Administrative decisions determined what to produce, by

whom, and for what purposes. During the initial Five-Year Plan from 1981 to 1985, the government retained control over the economy. Progress was made in economic development, particularly in rice production. Nevertheless, development is accompanied by high inflation,[2] high fiscal deficits, increasing trade shortfalls, overvalued and various exchange rates, and rising foreign debts (Leebouapao and Sayasenh 2017).

In 1986, the Communist Party Congress endorsed the New Economic Mechanism (NEM), a series of economic reforms similar to China's Reform and Opening Up in 1978 and Vietnam's Renovation in 1987 (Hansen, Bekkevold, and Nordhaug 2020). The NEM included measures to (1) reform the economic system to allow market forces; (2) open up the economy; and (3) stabilize, deregulate, and improve its performance (Leebouapao and Sayasenh 2017). Within the NEM, several monetary and fiscal reforms were introduced, such as price and exchange rate liberalization, support for foreign investment, and improvements in the tax and tariff systems. Despite these changes, the national economy's development and the standard of living remained relatively low. GDP per capita experienced a fourfold decline between 1985 and 1988. By the end of the Five-Year Plan from 1986 to 1990, GDP per capita stood at US$200.6, classifying Laos among the world's poorest countries (World Bank 2021).

While the NEM was endorsed in 1986, the actual implementation of reforms began slowly. Initial reforms from 1986 to 1988 focused on enhancing the structure and performance of state-owned enterprises, selective deregulation of agricultural marketing management, and the development of the private sector and trade reform. Since 1988, the reform process gained momentum, and significant measures have been taken to improve macroeconomic management,

[2] Reaching 114% by the plan's conclusion (IMF 2021).

including fiscal, monetary, and trade policies, as well as state-owned enterprises (Leebouapao and Sayasenh 2017).

Following the initiation of NEM in 1988, the development of the Lao banking sector can be categorized into different periods. In the first phase of reforms in the late 1990s, the government issued an agreement on banking system transformation, the country moved away from a mono-bank system instituted in the State Bank of Lao (SBL) since 1975 and replaced by a two-tier banking system.[3] Separating central banking from commercial banking activities of the SBL allowed its branches spun off as independent banks to have branches nationwide (Davading, Alessandro, and Kazi Mahbub-Al 2003). In 1990, the Central Bank Law (No. 4) established the Bank of Lao PDR (BOL) as the country's central bank, in place of SBL. Four more state-owned commercial banks (SOCBs) were created during 1990-1991. All seven SOCBs were under the management control of BOL. A first joint venture bank with 30% government equity was also established. All SOCBs were under direct supervision from BOL and each was assigned a geographical area of coverage (Bowrin, Adelma 2002).

After a two-tier banking system, SOCBs gained independence in their operations. At this time, BOL pushed for reforms in the financial sector, emphasizing the strengthening of prudential rules, improving the financial marketplace, and adjusting how the central bank enforces monetary policies to match changes in the financial sector. Thereafter, the government issued a decree on managing commercial banks and financial institutions in 1992, making it

[3] Mono-banking system mean the central bank play both role of national bank and commercial bank. When Laos transformed the mono-banking system into a two-tier, it means that the banking system then has the first tier, called the "central bank," handled national currency management, monitored monetary and foreign exchange matters, oversaw centralized transactions, and looked after the stability of financial institutions. The second tier comprised commercial banks, which were created by converting branches of the national bank into banks that operated and provided financial services as commercial banks.

more efficient for the central bank to oversee commercial banks (Bank of the Lao PDR 1993). Since then, commercial banks have had the roles of being financial intermediaries that take deposits and savings from the public, offer credits and loans, provide settlement and money transaction services, do foreign-money exchange, and contribute to investments in the country and abroad.

Following the same phase of transformation in the banking system, microfinance in Laos began its development during the early 1990s as VFs were operating in various areas of the provinces of the country. Initially, this process received support from both multilateral and bilateral organizations, focusing on creating village-based credit schemes and revolving funds aimed at enhancing food security. NGOs joined this effort between 1994 and 1996, and by 1996, over 20 international organizations were involved in rural credit programs spanning all 17 provinces. These projects were conducted in collaboration with government entities, including the Department of Social Welfare and various mass organizations. Originally, these initiatives primarily focused on providing credit. However, starting in 1997, there was a gradual shift towards promoting savings. In Laos, villages tend to be small, often with fewer than 100 households on average. Consequently, most emerging credit groups were also small in scale. With donor support, the number of credit schemes and revolving funds expanded rapidly. The rapid proliferation of VFs, their heavy emphasis on credit, and their reliance on donors raised concerns about their long-term viability and sustainability. Therefore, there was a growing need to establish sustainable microfinance practices, which necessitated the development of a legal framework (Hans and Bernward 2012).

To address these concerns, BOL took steps by creating a dedicated Microfinance Institution Division under the Commercial Bank and Financial Institution Supervision Department in 2004. The following year, BOL enacted Regulation No. 10/BOL to establish

rules for MFIs operating in the Lao PDR. This regulation outlined that larger MFIs were required to obtain licenses directly from BOL.[4] While smaller entities including credit unions, and savings and loan associations (such as VFs), were subject to registration from related government authorities based on the scale of their operations (Hans and Bernward 2012). Afterwards, MFIs have emerged as distinct entities separate from VFs. The differences between MFIs and VFs include regulatory oversight, design and structure, organization, capital and resources, and the range of products and services they provide, as illustrated in Table 1.

In terms of regulatory oversight, MFIs function within the governance of the financial regulator (BOL), adhering to comprehensive regulations. This regulatory framework includes responsibilities for supervision, incorporating off-site analysis and on-site inspections. In contrast, VFs governed by specific bylaws, lack oversight from regulatory and supervisory authorities. In addition, when turning to design and structure, MFIs obtain licenses from the BOL, following structured internal rules, business plans, and policies. Their well-defined organizational setup includes a shareholders meeting, a Board of Directors (BOD), an internal audit committee, Managing Directors (MDs), division heads-units, and qualified staff.

[4] Two types of MFIs that comprise the Deposit-taking Microfinance Institutions (DTMFIs) and Non-deposit Taking Microfinance Institutions (NDTMFIs) require to have the authorized capital for getting license from BOL. Initially DTMFIs were required to have authorized capital of 1 billion LAK, as outlined in Regulation No. 04/BOL on deposit microfinance supervision, dated 20 June 2008. Subsequently, individuals and organizations, including VFs seeking to transition to MFIs, had to meet the eligibility criteria to obtain licenses from BOL. Under Decree No. 460/GOV on microfinance, DTMFIs were mandated to have authorized capital of 3 billion LAK, while NDTMFIs required 200 million LAK. In the latest decree on microfinance, No. 184/GOV, dated 20 June 2022, the capital requirements have been substantially revised. DTMFIs must now possess authorized capital of 30 billion LAK, while NDTMFIs must have 10 billion LAK.

Table 1. The difference between Commercial bank, MFI, and VF

Differential	Commercial bank	Microfinance Institution	Village Fund
Regulatory Oversight	Governed by the BOL under the Law on the Commercial Bank, No. 39/NA, dated 17 July 2023, which establishes comprehensive regulations covering operating procedures, accounting, reporting requirements, and stability measures. The BOL also takes on supervisory responsibilities, including off-site analysis and on-site inspections.	Governed by the BOL under the Decree on Microfinance, No. 184/GV, dated 20 June 2022, which establishes comprehensive regulations covering operating procedures, accounting, reporting requirements, and stability measures. The BOL also takes on supervisory responsibilities, including off-site analysis and on-site inspections.	Governed by specific bylaws but lacks oversight from regulatory and supervisory authorities like the BOL.
Design and Structure	Established by obtaining a license from the BOL, requiring internal rules, business plans, and policies for deposit, loan, credit, and other financial services. Have a structured organization with a shareholders meeting, the BOD, the committee of the BOD, MDs, division heads-units, and qualified staff. Human resources are checked by the BOL for qualification before issuing a license. The organizational structure includes committees, MDs, and staff with approval needed from the BOL for any changes. Require adequate capital, reasonable office/branch, and approved changes to their structure from the BOL.	Established by obtaining a license from the BOL, requiring internal rules, business plans, and policies for deposit, loan, credit, and other financial services. Have a structured organization with a shareholders meeting, the BOD, an internal audit committee, MDs, division heads-units, and qualified staff. Human resources are checked by the BOL for qualification before issuing a license. The organizational structure includes committees, MDs, and staff with approval needed from the BOL for any changes. Require adequate capital, reasonable office/branch, and approved changes to their structure from the BOL.	Established based on voluntarily agreed-upon rules with the involvement of village officials. Members establish their own rules and regulations, elect a management committee, and manage loans, savings, repayments, and financial records. Utilize simple and somewhat unreliable paper-based administrative systems, mainly funded through contributions made by members.
Products and Services	Commercial banks can accept deposits from the general public and provide loans and other financial services.	Differentiated into NDTMFI and DTMFI based on regulations. NDTMFI provides microloans and other financial services, while DTMFI can accept deposits from the general public and provides microloans and other financial services	Primarily member-funded, accumulating savings for lending to other members.

Moreover, the BOL verifies the qualifications of human resources of MFIs before issuing a license, and any changes to the organizational structure necessitate approval from the BOL. Conversely, VFs are established based on voluntarily agreed-upon rules and are managed by elected members. They operate with a simpler administrative system, primarily funded through contributions made by members.

Regarding products and services, MFIs are categorized into Non-deposit Taking Microfinance Institutions (NDTMFI) and Deposit-taking Microfinance Institutions (DTMFI). NDTMFIs provide micro-loans and other financial services, while DTMFIs can accept deposits from the general public and offer micro-loans and other financial services. In contrast, VFs are primarily member-funded, accumulating savings for lending to other members. Therefore, the distinction between MFIs and VFs emphasizes a path of development and regulatory adaptation in the microfinance sector. Following this separation, BOL further strengthened its regulatory capabilities in 2010 by establishing the Financial Institution Supervision Department (FISD)[5] to oversee non-bank financial institutions. By the end of 2011, BOL had successfully registered 25 MFIs (Bank of the Lao PDR 2011). In 2012, the introduction of Decree No. 460/GOV on microfinance further regulated MFIs, leading to an increase in their number from 44 in 2014 to 120 in 2021, with a main focus on private operation and about 5% support by NGOs. The decree's improved regulatory clarity is one factor contributing to the surge in MFI numbers. The implementation of this regulation is likely to have made it easier for potential entrants to understand the rules and expectations set by the government, fostering a more transparent and regulated microfinance sector. Furthermore, the regulation may have contributed to the

[5] BOL divided the Commercial Bank and Financial Institution Supervision Department into two separate departments: the Commercial Bank Supervision Department and the Financial Institution Supervision Department.

credibility of MFIs. The guidance of instruction and ethical standards in the microfinance industry provided by the regulatory framework may have instilled confidence among potential investors and other stakeholders, resulting in the establishment of new MFIs.

Distinguishing MFIs from VFs, certain similarities with commercial banks occur, particularly in terms of regulatory oversight governed by BOL but under distinct regulations. Specifically, MFIs operate under the Decree on Microfinance, No. 184/GOV, dated 20 June 2022, while commercial banks adhere to the Law on the Commercial Bank, No. 39/NA, dated 17 July 2023. Moreover, despite sharing some similarities in design and organizational structure, disparities emerge in aspects such as size, qualifications of human resources, and facilities between MFIs and commercial banks. Commercial banks undergo more stringent scrutiny by BOL. Both institutions require adequate authorized capital for licensing, yet the authorized capital for commercial banks exceeds that of MFIs. According to the Law on Commercial Bank, commercial banks require authorized capital exceeding 1,000 billion LAK, whereas, under the Decree on Microfinance, MFIs need 30 billion LAK for DTMFIs and 10 billion LAK for NDTMFIs. Furthermore, while both MFIs and commercial banks offer financial services to the public, they differ significantly in scale and scope. Commercial banks provide a wide range of financial services, including deposit-taking and various loans and credits with larger limits. On the other hand, MFIs concentrate on offering financial services on a more restricted scale. NDTMFIs specifically focus on providing micro-loans, each not exceeding LAK 50 million,[6] while DTMFIs take deposits from the general public and provide other micro-financial services on a smaller scale.

[6] As micro-loans specified in the Implementation Guidelines of Microfinance Decree No. 01/BOL, dated 19 April 2016.

The clear distinction between MFIs and commercial banks lies in their target clients, with low-income and vulnerable individuals benefiting more from MFIs due to the small scale of micro-financial services, making them more accessible compared to commercial banks. Unlike some countries, such as Bangladesh with figures like Muhammad Yunus,[7] Laos does not have a particular individual or organization renowned for promoting the microfinance sector. However, the Lao government and international organizations, including GIZ, have played a significant role in contributing to the development of microfinance in Laos, with GIZ establishing the GIZ-AFP project.

This initiative establishes and supports seven Network Support Organizations (NSOs)[8] to enhance the capacity of VFs (Dennis and Thorsten 2017). These NSOs play a crucial role by providing technical support, including financial education, bookkeeping, and procedural guidance to VFs, functioning as financial intermediaries. The NSOs have introduced wholesale lending activities to assist VFs in need of additional liquidity for their clients. VFs compensate the NSOs with a service fee of 0.42% of their outstanding credit portfolio each month. Additionally, the NSO offers liquidity management services, allowing VFs with surplus savings to deposit funds at an annual interest rate of 12%. These deposits are then utilized by the NSO to finance credit lending activities for other VFs in need of funds. However, conducting operations in remote rural areas poses challenges, as 65% of the total operating expenses of NSOs are covered by retail loans. In the short term, NSOs are not anticipated to cover all operational expenses solely through technical and financial services to VFs. To address this, the GIZ-AFP project provides a grant to NSOs, serving as a revolving credit fund. This fund is

[7] In 2006, he received the Nobel Peace Prize for establishing the Grameen Bank and innovating the principles of microcredit and microfinance (The Nobel Peace Prize 2006).
[8] All NSOs hold licenses as NDTMFIs issued by BOL.

utilized in cases where excess VFs are insufficient to meet wholesale demand or when retail clients need to borrow amounts exceeding the VF credit ceiling (Prochaska, Philipp, and Fischer 2012). In 2021, the seven NSOs initiated by the project played a pivotal role in assisting over 800 VFs (GIZ 2021). This underscores the robust relationship between VFs and their NSOs-NDTMFIs,[9] significantly contributing to the development of the microfinance sector.

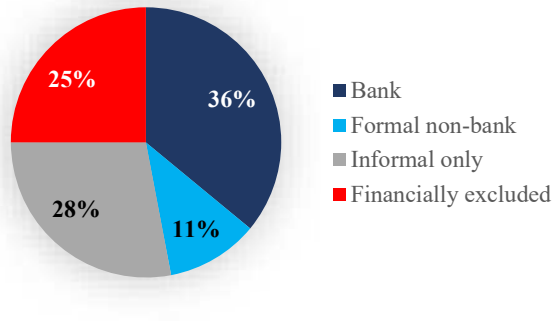
Despite recent significant contributions from both the banking and non-bank sectors to the development of the financial system, challenges continue in loan terms and interest rate payments, leading to a rise in the cost of fundraising. Acknowledging these limitations, the government integrated the establishment of a stock exchange into the national socio-economic development strategy (Lao Securities Exchange 2011). The opening of the Lao Securities Exchange (LSX) was established in 2010 through a collaboration, with BOL holding 51%, and Korea Exchange holding 49%. Initially introducing two listed companies, the LSX is currently subject to coordinated oversight by the Lao Securities Commission (LSC), which is supported by its dedicated secretariat office (ASEAN Social Security Association 2013). In 2021, the LSX has expanded, with 11 listed companies, indicating a gradual growth of the Lao capital market. This expansion is expected to make a significant contribution to the national economy by serving as a critical platform for companies to mobilize long-term funds necessary for the development and expansion of their manufacturing and services (Bank of the Lao PDR 2021). However, despite these advancements, the role of the capital market in promoting financial inclusion appears limited.

[9] While the GIZ-AFP project serves as a commendable initiative by providing support and grants to NSOs, it faces challenges due to the end of project in 2022. Additionally, certain NSOs encounter transparency issues, raising concerns about the stability of NSOs and the protection of savings for GIZ-AFP VF members.

2.3. Outlook of financial inclusion in Laos

In Laos, only 47% of the adult population[10] has access to formal finance[11], leaving the concern of financial exclusion in the country (FinMark Trust 2014). Figure 1 reveals a concerning gap in financial inclusion, with a significant proportion of individuals excluded from accessing formal financial services. It shows that while 36% of the population has access to financial services through banks, a staggering 25% remain financially excluded, indicating a significant need for increased access to financial services for marginalized individuals and communities.

Figure 1. Overall financial inclusion and exclusion in Laos



Source: FinScope 2014

Additionally, the data highlights the critical role of informal sources in filling the gap left by the lack of access to formal financial services, with 28% of individuals relying solely on informal finance.[12] With just 11% of the population having access to formal non-bank institutions, the need for reducing financial exclusion and expanding financial inclusion efforts remains a critical priority.

[10] In Laos, an adult must be at least 18 years old to create a bank account in their own name.

[11] In Laos, formal finance refers to the financial systems, institutions, and services that are regulated and supervised

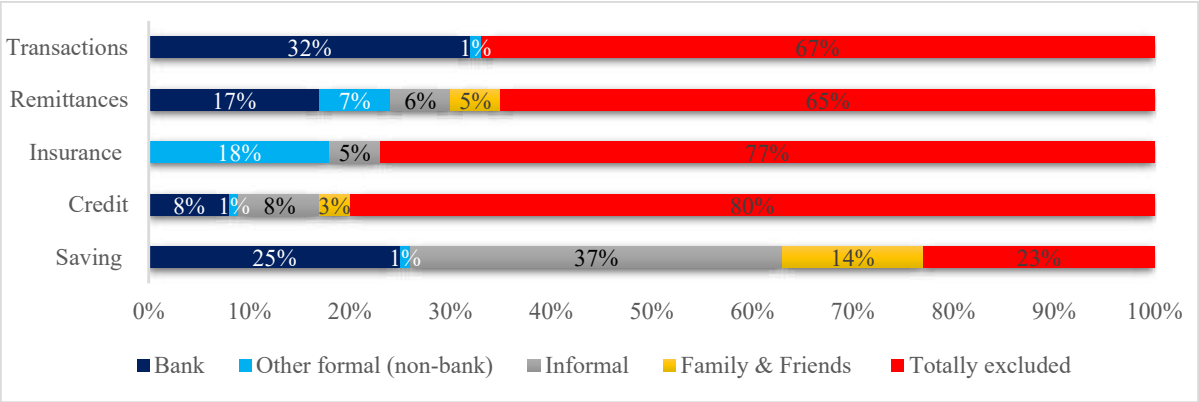
[12] The meaning of informal finance is broad and can vary across countries. Some studies define it as any financial transactions that occur outside of the regulatory framework of formal banking and other financial institutions (Aryeetey and Udry 1995). Examples of informal financing may include trade credit, borrowing from family and friends, private money lenders, and community cooperatives, among others (Allen, Qian, and Xie 2019).

Financial exclusion is a worldwide problem, with estimates suggesting that 2.3 billion adults of working age do not possess an account with a formal financial institution (Atkinson and Messy 2013). This problem consistently affects poor individuals, leaving a significant portion of them without access to essential financial services like credit, insurance, bill payments, and deposit accounts (Carbo, Gardener, and Molyneux 2007). In the context of Laos, the observed increase in consumption has only marginally lifted those escaping poverty above the poverty threshold, where the risk of falling back into poverty remains high. In fact, half of the individuals who were poor in 2012/13 were not poor five years earlier. Households, particularly those in agriculture, face vulnerability to various shocks, such as fluctuations in farm produce prices, land loss, and adverse weather conditions. Additionally, with only 20% of the population having health insurance, primarily among public and private sector wage earners, health-related shocks and substantial out-of-pocket expenses pose significant threats to household well-being. Ultimately, limited financial inclusion and the absence of sufficient safety nets constrain households' ability to cope with these shocks and risks (Najdov and Phimmahasay 2016).

In a world where a significant portion of financial transactions depends on bank accounts, the lack of access to banking services presents significant challenges. This is particularly concerning because an expanding number of payments are now conducted through bank accounts (Carbo, Gardener, and Molyneux 2007). Figure 2 highlights a troubling trend in Laos, with a significant proportion of individuals (67%) excluded from both formal and informal transaction services. For those with access, banks are the most common formal source (32%), with other formal non-bank sources being used by a mere 1%. Similarly, a considerable proportion of individuals (65%) are entirely excluded from formal and informal remittance services, with banks being the most common form of formal finance (17%), followed by other

formal non-bank institutions (7%), and informal sources (6%). Even family and friends play a small role, acting as a source of remittances for just 5% of individuals.

Figure 2. Financial access/usage across various types of finances and categories



Source: FinScope 2014

Moreover, individuals who cannot access mainstream credit options face substantial practical hurdles. These credit needs include both short-term solutions for managing fluctuations in household finances and various types of loans for larger purchases. Consequently, those excluded from the financial system often resort to "non-status lenders" who charge high fees. Since these loans are often secured by the borrower's property, the consequences of non-repayment can be especially dire (Carbo, Gardener, and Molyneux 2007). In Laos, the situation is even more dire for formal and informal credit services, with a whopping 80% of individuals excluded entirely. Among those with access to credit, banks are the most common formal source (8%), while other formal and informal sources account for a mere 1% and 8%, respectively. Family and friends also play a small role, acting as a source of credit for just 3% of individuals.

The absence of savings gives rise to several problems, with the most fundamental being the loss of security and flexibility that most people typically enjoy. Similar to the absence of insurance, the constant awareness of lacking a financial safety net is a persistent source of worry

for those who are financially excluded. The issue of being excluded from insurance becomes more concerning as the variety of risks that can be covered by insurance policies expands. Paradoxically, those who are financially excluded are often the most at risk from the types of risks that insurance can help mitigate. These risks include home contents, mortgage protection, life coverage, and long-term sickness coverage. Consequently, the repercussions of financial and social exclusion are amplified in such circumstances (Carbo, Gardener, and Molyneux 2007).

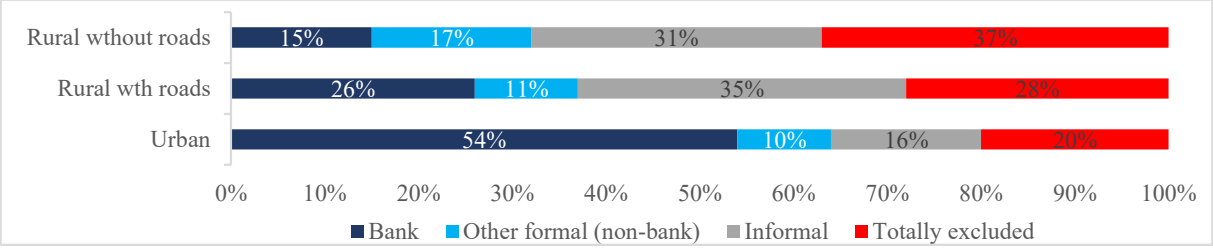
In the context of Laos, the situation regarding insurance services is concerning, with a vast majority of individuals (77%) being entirely excluded. Among those with access, another formal non-bank source is again the most common formal source (18%), followed by informal sources (5%). Finally, while formal finances such as banks remain the primary source of savings for individuals, a significant percentage (37%) relies on informal sources. Only a small fraction (1%) uses non-bank formal sources, with the majority of individuals relying on banks (25%). This presents a worrying picture, with a considerable proportion of individuals (23%) entirely excluded from accessing formal and informal savings.

Being part of a group excluded from mainstream financial services presents a set of challenges. Generally, managing a household budget outside the mainstream financial services sector is considerably more costly and often operates without regulation. Furthermore, when entire communities and areas have restricted access to financial products, this situation can become self-perpetuating and a substantial contributor to broader social exclusion (Kempson and Whyley 1999). In Laos, 64% of those with access to formal finance are located in urban areas (see Figure 3), while 37% and 32% are in rural areas with and without roads[13],

[13] According to the population census of Lao PDR in 2005, rural areas in the country were classified into two categories based on road accessibility: those with access to roads and those without. Road

respectively. Banks are the most common form of access to finance in urban areas, with 54% having access to them. In rural areas with roads, banks and other formal non-bank institutions each represent about a quarter of access to finance, while informal finance accounts for 35%. In rural areas without roads, informal finance is the most common form of access to finance (31%), followed by other formal non-bank institutions with 17%. The proportion of those who are totally excluded from financial services is highest in rural areas without roads, at 37%.

Figure 3. Access to finance based on location

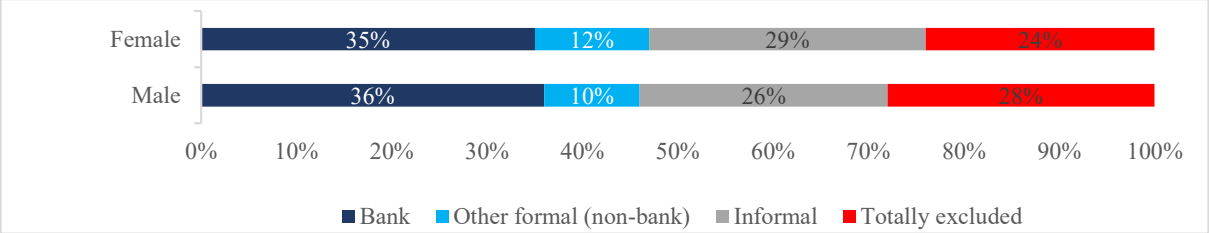


Source: FinScope 2014

Regarding access to finance by gender, Figure 4 indicates that 36% of males have access to financial services through banks, while 10% have access to other formal non-bank institutions. Meanwhile, 26% of males have access to financial services through informal providers, and 28% are completely excluded from formal and informal financial services. Among females, the percentage of those who have access to financial services through banks is slightly lower at 35%, while the percentage of those who have access through other formal non-bank institutions is slightly higher at 12%. The percentage of females who have access to financial services through informal sources is also slightly higher at 29%, while the percentage of those who are entirely excluded from financial services is slightly lower at 24%.

accessibility in rural areas was determined by the presence of usable roads during both the rainy and dry seasons.

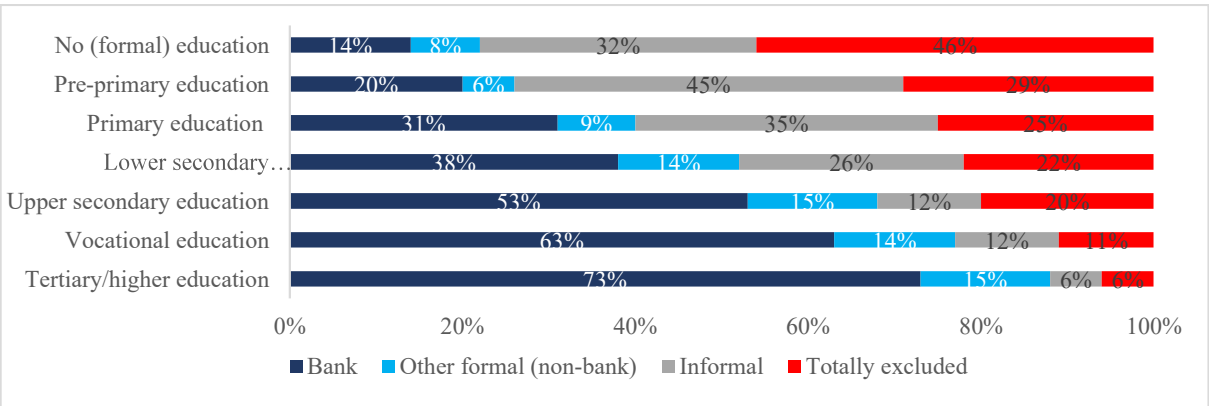
Figure 4. Access to finance based on gender



Source: FinScope 2014

In Laos, individuals with higher levels of education tend to have greater access to financial services. Figure 5 shows that those with tertiary or higher education have the highest percentage of access to financial services from banks (73%), followed by vocational education (63%), upper secondary education (53%), lower secondary education (38%), primary education (31%), pre-primary education (20%), and no formal education (14%). Informal sources of financial services are more commonly used by individuals with lower levels of education, with 35% of those with primary education and 45% of those with pre-primary education relying on informal sources for financial services. Those with no formal education have the highest percentage of individuals (46%) who are entirely excluded from formal and informal financial services.

Figure 5. Access to finance based on the education level



Source: FinMark Trust 2015

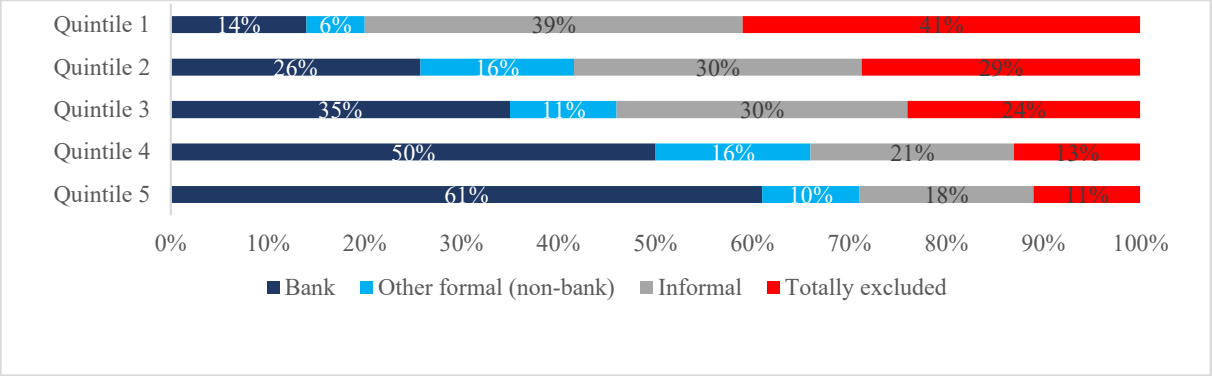
The trend of financial exclusion is observable in countries characterized by lower GDP per capita, relatively higher income inequality, lower literacy rates, limited urbanization, and inadequate connectivity, which tend to experience higher levels of financial exclusion (Sarma and Pais 2011). The study conducted by Aduda and Kalunda (2012) reinforces the argument that financial exclusion mirrors social exclusion, as it seems to be more prevalent in countries with low GDP per capita, limited urbanization, poor connectivity, low literacy rates, and relatively higher income inequality.

Nations characterized by low-income inequality, as measured by Gini coefficients for equivalent disposable income, typically experience lower levels of financial exclusion. Conversely, the most unequal countries tend to exhibit the highest rates of exclusion from financial services (Kempson et al. 2004). Additionally, it is worth noting that the Gini coefficient demonstrates a significant negative association with financial inclusion. In simpler terms, income inequality is inversely related to financial inclusion, meaning that greater income inequality is associated with a higher likelihood of financial exclusion (Sarma and Pais 2008). Countries with low-income inequality typically have high levels of financial inclusion (Buckland et al. 2005). In essence, marginalized and vulnerable populations are more affected by financial exclusion in the context of income inequality.

In Laos, there is a stark income-based divide when it comes to financial access. Figure 6 shows that the majority of individuals in the highest income quintile have relatively good access to formal financial services, primarily through banks (61%) and other formal institutions (10%), with a relatively small proportion relying on informal sources (18%) or being entirely excluded (11%). On the other hand, individuals in the lowest income quintile have limited access to formal finance, with only 14% having access to banks and 6% to other formal institutions, while the majority rely on informal sources (39%), or are entirely excluded (41%).

The trend of declining access to formal finance and increasing reliance on informal sources and exclusion is observed as we move from Quintile 5 to Quintile 1. For instance, 35% of individuals in Quintile 3 rely on informal sources, while 30% have no access to finance at all. Therefore, it highlights the need for targeted policies and interventions to address financial exclusion and reduce disparities across income quintiles.

Figure 6. Access to finance based on income



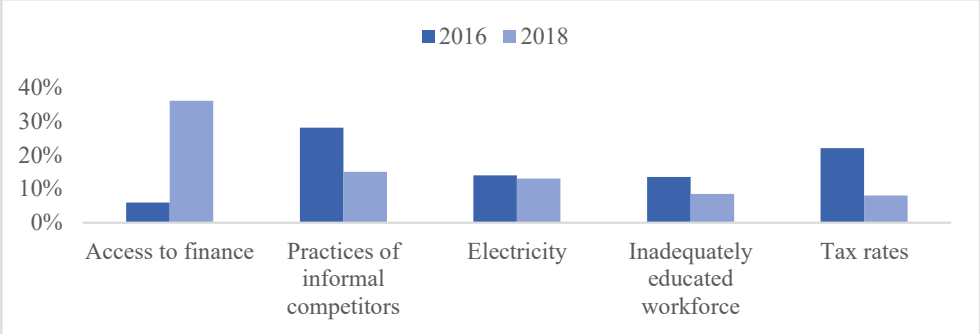
Source: FinMark Trust 2015

Financial exclusion does not impact only individuals but also businesses, and it is especially challenging for small and medium-sized enterprises (SMEs) in Laos. Access to finance has become a significant barrier for these SMEs (Phimmahasay et al. 2019). Data from the World Bank Enterprise Surveys highlights a significant shift in the importance of various constraints for SMEs in Laos. Among the 15 constraints examined,[14] access to finance has emerged as a considerably more prominent issue. In the 2018 Enterprise Survey, access to finance was the most frequently cited top constraint by registered SME firms, with 36% of them identifying it as their primary challenge. This represents a substantial increase from just 6% in

[14] Access to finance; access to land; business licensing and permits; corruption; court; crime, theft and disorder; customs and trade regulations; electricity; inadequately educated workforce; labor regulations; political instability; pratices of competitors in the informal sector, tax administration, tax rates; transport.

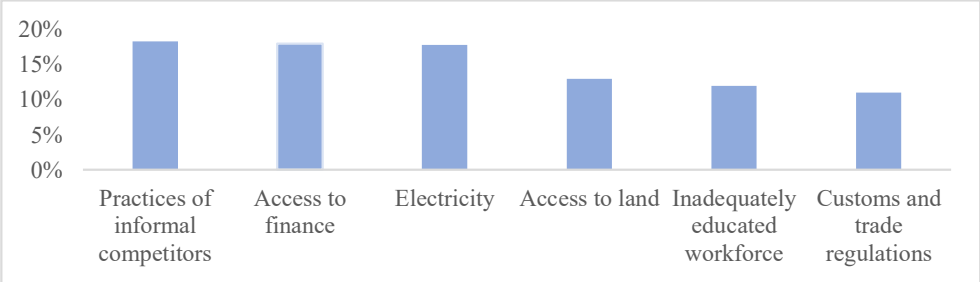
2016 (Figure 7). Furthermore, access to finance was the second most commonly reported "serious" obstacle for businesses (Figure 8), with approximately 18% of firms considering it a serious issue.

Figure 7. Obstacles facing formal SMEs firms in Laos



Source: WB Enterprise Surveys

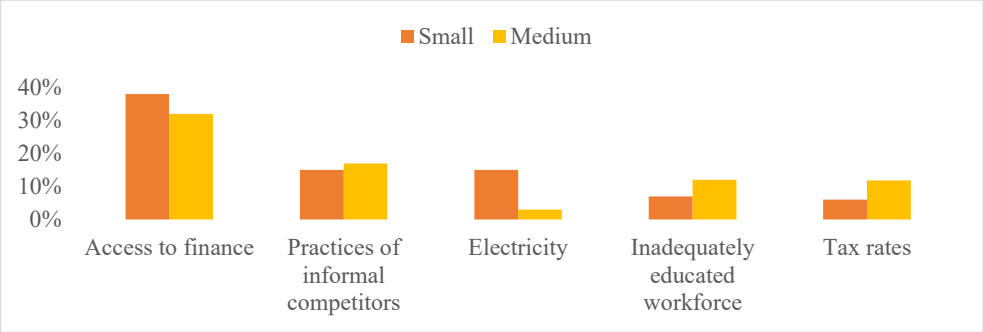
Figure 8. Identifying as a "serious" obstacle facing formal Lao SME firms in 2018



Source: WB Enterprise Surveys

Interestingly, when comparing small enterprises to medium-sized firms, small businesses are more likely to view access to finance as their most significant obstacle and also as a serious one (Figure 9). The emergence of access to finance as a prominent constraint for SMEs in Laos calls for attention and comprehensive policy interventions. Addressing this financial exclusion issue effectively can not only empower small businesses but also contribute to the overall economic development of the country.

Figure 9. Obstacles facing small in contrast to medium-sized SME firms in Laos



Source: WB Enterprise Surveys

The problem of financial exclusion is not new; there has always been a segment of the population without access to a wide array of financial services. The repercussions of lacking access to essential financial services like bank accounts, credit, savings, or insurance are far more severe now than they were in earlier times (Kempson and Whyley 1999). Limited access to financial services makes it tough for these households to save, plan for the future, seize economic opportunities, and handle unexpected financial emergencies. This limitation also hinders their ability to invest in education, buy homes, and pursue other paths to wealth-building. As a result, the lack of mainstream financial services has far-reaching consequences, including lower available income, reduced effectiveness of government aid programs, and obstacles to long-term investment (Barr 2004).

2.4. Banking sector

Banking is the backbone of Laos's financial system, with bank assets making up over 95.2% of the country's total assets in the financial sector. There are now 44 banks operating in Laos (Table 2); this includes 3 state-owned commercial banks, 1 specialized bank, 3 joint-state commercial banks, 8 private banks, 8 subsidiary banks, and 21 foreign branch banks. There are 114 commercial bank branches, 541 service units, 1,416 ATMs, and 1,629,448 ATM cards. In

2021, total banking assets amounted to LAK 166,661 billion, which was equivalent to around 90.1% of GDP. There was a total of LAK 128,149 billion in deposits at commercial banks and LAK 87,289 billion in credits given by commercial banks (Bank of the Lao PDR 2021).

Table 2. Bank statistics in Laos

Commercial banks	2021
Total number of banks	44
State-owned commercial banks	3
Specialized bank	1
Joint-state commercial bank	3
Private bank	8
Subsidiary banks	8
Foreign branch banks	21
Branches	114
Service units	541
ATMs	1,416
ATM cards	1,629,448
Deposits (LAK billion)	128,149
Credits (LAK billion)	87,298

Source: Bank of the Lao PDR 2021

However, the ratio of credit to deposit is just 68%, which is relatively low. This reflects the low level of financial intermediaries in the Lao banking industry since deposits outnumber loans. Even though deposits in the baking system have expanded over the past decade, the proportion of funds invested remains low. A low credit-to-deposit ratio in the banking sector in Laos can have a negative impact on financial inclusion as it can limit access to credit and other financial services.[15] According to studies on financial inclusion, mainstream banks typically

[15] People do not use financial services just for its benefit; they use them because they have underlying economic needs. These economic needs can include everyday expenses, supporting family members such as education and healthcare, ensuring a stable income for various purposes, planning for unexpected costs, and preparing for future events like buying assets or retirement. These are real economic requirements, unrelated to financial services, but they lead to financial needs such as transferring money, managing finances, handling risks, and achieving long-term goals. Financial services aim to fulfill these financial needs, which originate from fundamental non-financial

show little interest in serving low-income markets and households (Buckland et al. 2005). One key reason is that banks encounter high transaction costs when issuing small-scale loans (Morduch 2000; Beck and De La Torre 2007; Dorfleitner, Davide, and Quynh 2022). Assessing the risk of potential borrowers and monitoring their progress becomes especially tricky when dealing with poor individuals operating in the informal sector. And many low-income households lack sufficient assets that can be used as collateral to secure loans from banks (Morduch 2000).

In Laos, despite the number of banks and their services having increased, they are mainly concentrated in urban areas and do not readily extend their services to rural areas (Figure 3). However, the data from the Making Access Possible (MAP) project illustrates that poor[16] and excluded individuals in Laos often find ways to access the resources they need. They utilize a combination of formal and informal financial services to meet their needs, demonstrating that consumers maintain some degree of control over their finances. Even when they use less effective financial methods (informal finance), consumers continue to spend money on essential resources such as education, healthcare, and basic services to pursue employment and income opportunities. Consumers are often on the fringes and engaged in the informal sector, making them somewhat disconnected from the formal financing system (UNCDF 2021). Furthermore, the data from Figure 3 above shows that in rural areas of Laos, people primarily rely on informal finance for their financial service needs. With banks primarily located in urban areas, individuals in rural areas who are already facing financial difficulties may find it even more challenging to access credit and other financial services from banks.

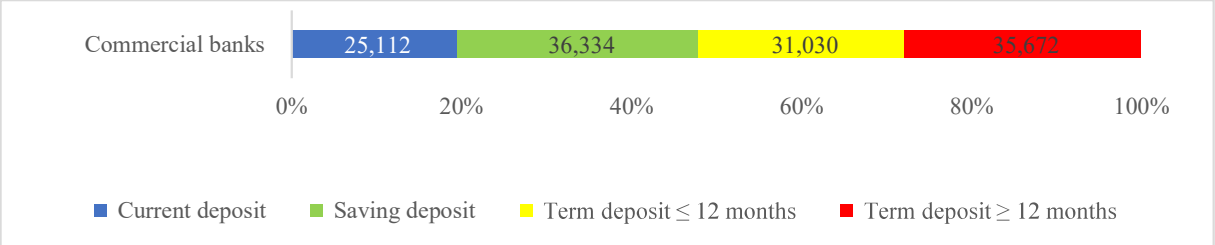
economic needs, often referred to as real economic needs. Without these real economic needs, there would be no demand for financial services (UNCDF 2021).

[16] In Laos, urban areas have a poverty rate of 7%, while rural areas exhibit a poverty rate of 23.8% (Lao Statistics Bureau and World Bank 2020).

Moreover, a significant proportion of deposits held by commercial banks in Laos are short-term, as illustrated in Figure 10. In 2021, short-term deposits, defined as deposits with a maturity of 12 months or less, constituted approximately 72.2% of total deposits, amounting to LAK 92,477 billion. Within this sum, fixed or term deposits made up 27.8% of the total deposits in commercial banks (Bank of the Lao PDR 2021). However, despite the classification of most deposits as short-term, these funds are being they are being directed towards long-term investments, particularly in industries and construction, as seen in Figure 11. This raises concerns about maturity transformation or a mismatch in the banking sector.[17]

Figure 10. Deposit in commercial banks

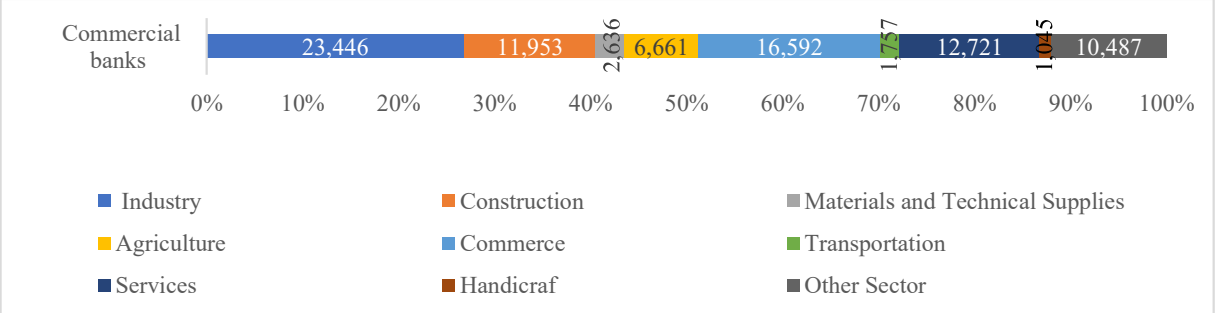
In billion LAK



Source: Bank of the Lao PDR 2021

Figure 11. Credit from commercial banks by sectors

In billion LAK



Source: Bank of the Lao PDR 2021

[17] The practice of "borrowing short and lending long" is commonly referred to as maturity transformation or a mismatch. When a bank engages in this practice, it means that it does not maintain sufficient cash reserves to cover all its obligations, which increases the risk of bank runs and financial crises (Carpio 2011).

It has long been recognized that maturity mismatches between liabilities (deposits) and assets (loans) on a bank's balance sheet can lead to liquidity crises (Rajan 2001). Banks typically aim for an optimal alignment between their assets and liabilities. Maturity differences between a bank's deposits and loans can expose them to the risk of bank runs. Conversely, a deliberate mismatch, often involving short-term deposits and moderately longer-term, higher-yield loans provided to clients, forms a core element of the business model for many banks. Asset-liability imbalances can be managed, reduced, or protected against (Bourakba and Belouafi 2015).

However, if the majority of long-term loans are financed using short-term deposits and the availability of these wholesale deposits decreases, it can result in a significant increase in maturity mismatches (Acharya and Skeie 2011). Rajan (2001) introduced a model examining banks, maturity mismatches, and liquidity crises, highlighting that banks must decide on the maturity structure of their loans, even though the quantity of loans is constrained by standard banking limits. Opting for a short-term maturity structure for liabilities introduces the risk of facing a liquidity crisis when providing long-term loans. This is because, in such a scenario, banks may struggle to quickly convert their assets into cash to meet potential claims against them.

Banks that rely on the short-term money market rather than core deposits to fund loans may encounter liquidity problems in the future (Saunders and Cornett 2008). Research by López-Espinosa et al. (2012) underscores that a primary factor influencing a bank's impact on global systemic risk is its reliance on short-term funding, often referred to as funding liquidity. Their findings support the Basel Committee's suggestion to implement a net stable funding ratio, discouraging excessive vulnerability to liquidity-related risks.

In the context of the banking sector in Laos, when banks use short-term deposits to fund long-term investments, it can result in an "asset-liability maturity mismatch" and pose liquidity

risks for these banks. To address this current situation, banks may need to consider a range of strategies to attract more long-term deposits. This could include offering higher interest rates on long-term deposits or other incentives to attract long-term savers. However, this approach could result in higher costs for financial products and services, potentially creating barriers to financial inclusion for those already facing challenges meeting the credit terms of banks.

2.5. Informal finance

Village funds (VFs)[18] in Laos operate outside the scope of regulation, falling into the category of informal finance (FinMark Trust 2014). These VFs are numerous and estimated to be around 4,000 to 6,000 in number and are key players in the informal financial services landscape (FinMark Trust 2015). The objective of VFs in Laos is to provide savings and credit services to the inhabitants of a village, where the residents collectively initiate, possess, and manage the fund. With VFs, individuals with limited financial means can save money and access loans according to their preferences, all within their own village and without the need to venture elsewhere (Linda and Eva 2008).

In a time of more than 25 years, approximately half of all villages have established semi-formal village-based funds, with most of them receiving financial support from donors and being endorsed by various levels of government. These VFs are governed by specific bylaws, utilize simple and somewhat unreliable paper-based administrative systems, struggle to meet basic reporting requirements, and function without oversight from regulatory and supervisory authorities such as the BOL. At present, the majority of these VFs have been funded through

[18] Some call village development funds (VDFs) or village banks (VBs). These organizations, named by the founder as partnerships between the Lao government and donors, show differences in name but share similarities in regulatory oversight, design and structure, and products and services.

contributions made by their members, essentially operating as village savings and loan funds[19] (UNCDF 2021).

When members deposit their savings into the VFs, the money accumulates and can be used for lending to other members or placed in a commercial bank account to earn interest. Members who borrow from the VFs pay interest on their loans, which serves to cover the operational expenses of the VFs and contribute to their growth. At the end of each year, members receive interest on their savings. This interest is paid out from the surplus funds of the VFs, and the amount allocated to each member is determined based on their savings activity throughout the year (Linda and Eva 2008).

VFs in Laos face several challenges, primarily stemming from ineffective management at the village and district levels. Supervisors[20] have struggled to provide adequate oversight, and VF management teams often lack fundamental knowledge of finance and accounting (UNCDF 2021). Approximately half of the committee members possess only primary or secondary education, while over one-third have completed high school (Sisoumang, Vute, and Visit 2011). The operational framework of VFs relies on bylaws that lack crucial elements of good governance and are not adequately integrated into the legal and financial-sector regulatory framework. This absence of robust oversight raises concerns about the prudent allocation of limited resources. Additionally, the majority of VFs face challenges in providing reliable performance statistics and meeting minimal regulatory reporting requirements essential for effective monitoring. Since VFs are established based on voluntarily agreed-upon rules

[19] A village savings and loan funds typically take the form of informal community-based financial groups or associations. These groups are composed of members from the same village who come together to pool their savings and provide access to small loans. In other word, individuals must become members by pooling money or saving before they can access loans.

[20] In Laos, VFs are overseen by local political authorities, such as the village head and mayor. Meanwhile, VF members elect the village's management committee, and these committee members serve voluntarily.

involving village officials, the extent of their legal and political control remains unclear (UNCDF 2021).

According to the Financial Inclusion Roadmap (FIRM),[21] VFs are highly unstable, putting members' life savings in danger. Despite this report, it still suggested strengthening VFs to increase their sustainability and relevance to the rural population, on the assumption that the GIZ-AFP project,[22] in which FIRM explained that 10% of all VFs were involved, had proved that VFs can be successful and sustainable only with appropriate assistance and oversight through local top organizations. However, there is still evidence that the AFP-VF system, like other VFs in Laos, has chronic operational and financial issues that pose serious threats to the organization's long-term viability and the financial security of their members, meaning they do not meet "do no harm" donor requirements.[23]

A notable example is the Lao Women Union (LWU),[24] where the primary issue was the limited scope of VF activities confined to individual villages that they support. The fundamental problem also came from the absence of an effective management system and committees capable of addressing the challenge of accessing funds. In a critical situation within the saving groups (SGs), loans totaling LAK 1,289 million were provided, with Non-Performing Loans

[21] The FIRM functions as a strategic plan for financial inclusion in Laos, defining key national priorities. Its objective is to enhance financial inclusion, aiming to improved welfare, increased incomes and growth, and lining with national development goals (FinMark Trust 2016).

[22] BOL has registered and licensed the GIZ-AFP VF systems. In consequence, both GIZ and BOL have an interest in protecting the VFs' future and a fiduciary duty to safeguard the villagers' savings. Due to GIZ's impending departure in May 2022 without a well-planned and reported exit strategy. There must be a strategy in place right away to safeguard the savings of GIZ-AFP VF members.

[23] Some NSOs that acquired licenses as NDTMFIs faced issues related to internal management, which might reduce the capability to supervise AFP-VFs. These challenges prompted the BOL to conduct special and urgent on-site inspections, revealing transparency problems that posed a threat to their financial stability. As a result, reforms were initiated in the management teams of NSOs-NDTMFIs to enhance their capability and ensure institutional resilience.

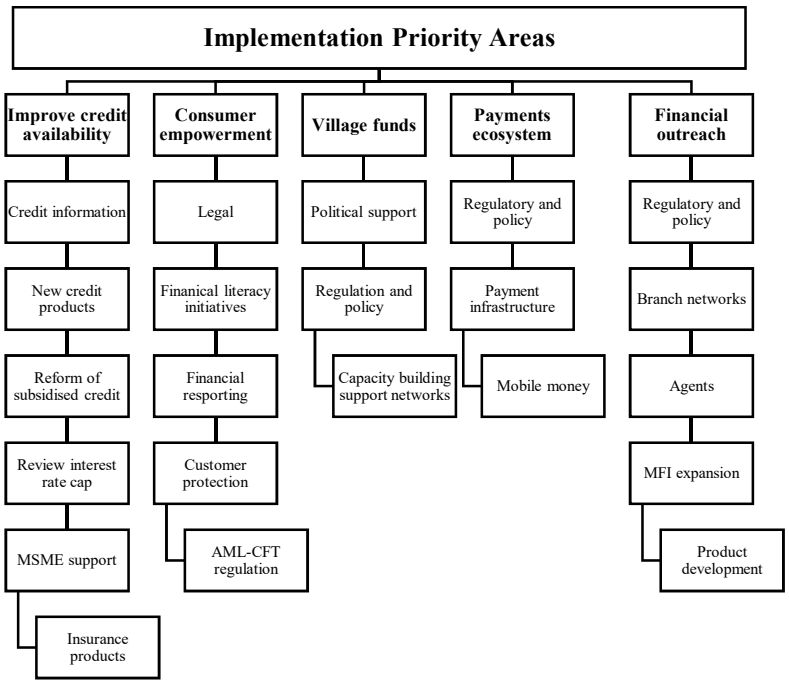
[24] LWU is a Laos-based women's rights organization. It is in charge of promoting government policies concerning women. LWU established and supervises VFs, which are village-based saving groups.

(NPLs) reaching 66.7%. The core monitoring organization, in collaboration with LWUs such as the Women's Empowerment in Communities Project (WECP), withdrew from the SG program. Unfortunately, LWU, responsible for supervision, failed to establish a new monitoring system for these funds (Fujita 2015). The managers at the relevant LWUs have concluded that more than 90% of the VFs they support have severe, systemic issues and are close to failure. Experts agree that half of the LWU-initiated VFs have faded away, with others having re-emerged entirely (UNCDF 2021). Additionally, the main challenges VFs relate to ethical considerations and the governance of management personnel. Issues such as personal privilege and a lack of transparency were significant contributors to these challenges. Despite consistent technical support from the public sector, management issues often arose due to personal relationships and social organization within the villages. In instances where members disregarded established rules, management hesitated to enforce them (Sisoumang, Vute, and Visit 2011).

Despite the challenges faced by VFs, there is an effort to enhance their sustainability and continued relevance in serving rural communities. These VFs play a vital role as financial institutions for impoverished households, offering them access to semi-formal savings and credit solutions that align well with their cultural and social context (FinMark Trust 2016).

To advance this objective, the FIRM outlines five key priorities, as shown in Figure 12. These priorities encompass: (1) Improving the working of the credit market (2) Consumer protection and empowerment; (3) Strengthening VFs; (4) Payment eco-system development; and (5) Extending the outreach of banks and other financial service providers.

Figure 12. The proposed priorities of the national financial inclusion goal



Source: FinMark Trust 2016

To improve VF functionality and address sustainability concerns, the FIRM suggests implementing a more formal regulatory and supervisory framework along with support services. This would boost trust and confidence in VFs, enabling them to better serve the financial needs of poor households and facilitate connections with other financial institutions like banks and MFIs. However, it is important to note that the study also highlights challenges. While a minority of VFs are successful, growing, and sustainable, the majority are deemed unsustainable under current arrangements. The supervision of VFs is unclear, and most operate without effective oversight, posing risks to savings deposits. Despite their political significance, VFs lack a champion willing to drive the entire sector towards sustainability.

To facilitate sustainability and improved relevance of VFs, the FIRM outlines a set of interventions and corresponding activities aimed at improving the VF sector. Table 2 indicates that under the regulatory intervention, it is suggested that BOL should assume regulatory and

supervisory responsibilities for VFs. This entails the creation of a comprehensive set of regulations encompassing various aspects such as operational procedures, accounting and reporting standards, cash and risk management, and provisioning. These regulations would apply to all VFs, with the possibility of them being scaled based on VF size. BOL would directly oversee larger VFs, those exceeding a predetermined size, while smaller VFs would have their supervisory responsibilities delegated to regional support organizations. Additionally, there is a call to develop regulations for VF-support organizations, which would also fall under BOL's supervision.

On the developmental front, Table 2 illustrates that the FIRM emphasizes the need to garner wide-ranging political support for the objective of stabilizing the VF sector and implementing reforms. This includes a commitment to allocate resources to ensure sustainability and enable the sector to reach its full potential. The roadmap suggests leveraging the experience gained from the GIZ-AFP project to implement effective support and supervision mechanisms for VFs nationwide. It advocates for the promotion of regional VF support organizations or the transformation of existing entities into more efficient and properly structured support organizations. Furthermore, there is a proposal to establish a third-tier organization specifically focused on training and auditing. Lastly, the roadmap proposes considering Nayoby Bank[25] as a potential source of wholesale credit for successful VFs. These interventions collectively aim to enhance the sustainability and effectiveness of VFs in serving their communities.

[25] Nayoby Bank is financial institution that holds a unique status as a non-profit legal entity under the oversight of the Bank of Lao PDR. Nayoby Bank administers and deploys policy loans to provide credit support for commercial production activities in the 64 most disadvantaged districts.

However, following the implementation of the FIRM, an assessment has been conducted to gauge the accomplishments, revealing a range of progress in various priority areas. Some planned activities have been completed, while others are still ongoing, reflecting the nature of many of these activities, which were designed for medium to long-term implementation and could not realistically have been finalized at this stage. Table 3 presents a detailed assessment of the implementation progress of the FIRM with a focus on strengthening VFs. Each planned activity is evaluated based on its current status, categorized as follows: activities that are fully achieved (1), activities that are partially achieved or in progress (2), activities that have not been achieved (3), and activities for which the status remains unclear (N).

In the effort to strengthen VFs, there are a total of nine activities,[26] but the progress has been uneven, with only one fully achieved, three in progress, and five not achieved or unclear (see Table 3). Under the regulatory intervention, one notable activity involves BOL taking regulatory and supervisory responsibility for the VF sector, which is currently marked as in progress (2). While this suggests some advancement, the details provided in the report are somewhat vague. A more comprehensive account of actions taken and any encountered challenges is essential for a clearer assessment. On the other hand, activities related to establishing regulations for VFs and delegating supervisory responsibilities to regional support organizations are labeled as unclear (N). The lack of progress in these critical areas raises concerns as clear regulations are fundamental for ensuring VF stability and proper functioning. The absence of regulatory guidance can introduce potential risks for participants. Furthermore,

[26] Following a review of the FIRM implementation, it was decided to remove a specific activity outlined in the FIRM 2016-2020 plan: "BOL taking direct responsibility for supervising larger VFs (with a balance sheet size above an agreed level)." This decision was made because it was deemed unlikely that this activity could be practically achieved, leading to its exclusion from the updated FIRM 2018-2025 plan.

the lack of clarity regarding supervisory delegation suggests a lack of direction, necessitating a well-defined plan for implementation.

The development of regulations for VF-support organizations and their supervision is also categorized as unclear (N). This mirrors the previous point and raises questions about the framework within which these organizations operate. This lack of clarity has the potential to hinder their effectiveness. Meanwhile, within the developmental intervention, the mobilization of political support for stabilizing the VF sector and implementing reforms is marked as not achieved (3). This represents a significant setback, as political support plays a pivotal role in driving policy changes and resource allocation. The lack of achievement in this area indicates a potential obstacle to progress.

Leveraging the experience of the GIZ-AFP project to implement support and supervision mechanisms for VFs nationwide is marked as in progress (2). While this indicates some headway, it is imperative to provide more specific information regarding the implementation of these mechanisms. Without concrete details, assessing their effectiveness remains challenging. Similarly, the promotion of regional VF support organizations or the conversion of existing entities is categorized as in progress (2). While progress is noted, the assessment lacks information about the actual impact of these promotional efforts on VF strengthening. Notably, the establishment of a third-tier organization for training and auditing is noted as fully achieved (1), which is a positive outcome signifying success in at least one aspect of the developmental activities. However, considering Nayoby Bank as a potential provider of wholesale credit to successful VFs is labeled as unclear (N). The lack of clarity surrounding Nayoby Bank's role raises questions about the feasibility of this initiative, potentially representing a missed opportunity to benefit VFs.

Table 3. Activities and status to strengthen VFs

Intervention	Activities	Timeframe	Status of each planned activity
Regulatory	BOL should take on regulatory and supervisory responsibility for the VF sector	Medium	2
	BOL should establish a set of regulations, covering operating procedures, accounting and reporting requirements, cash and risk management, provisioning etc. applicable to all VFs, perhaps graduated and related to size.	Medium	N
	BOL to take direct responsibility for supervising the larger VFs (with a balance sheet size above an agreed level).	Medium	Removed
	Delegate supervisory responsibility for smaller VFs (the majority) to regional support organizations.	Long	N
	Develop regulations for VF-support organizations and supervise them.	Long	N
Developmental	Mobilize broad-based political support for the objective of stabilizing the VF sector and undertaking reforms, committing resources to ensure sustainability and fulfilment of potential.	Short	3
	Utilize the experience of the GIZ-AFP project to roll out effective support and supervision mechanisms for VFs nationwide.	Medium	2
	Promote the establishment of regional VF support organizations; or conversion of existing entities to more effective and properly structured support organizations	Medium	2
	Establish a third-tier organization for training and auditing.	Long	1
	Consider Nayoby Bank as a provider of wholesale credit to successful VFs.	Long	N

Source: FinMark Trust 2016 and UNCDF 2021

Consequently, despite efforts and the implementation of the FIRM with targeted activities, the existence of problems within VFs in Laos raises questions about the slow progress in strengthening these funds. Several potential explanations contribute to the existing issues. The execution of proposed activities indicated in the FIRM may confront difficulties in terms of effective implementation. Issues such as inadequate resources, insufficient training, and logistical restrictions could hinder the successful execution of planned initiatives. Moreover, the complexity of VFs' issues may slow the progress. The multiple challenges faced by VFs, including operational limitations, financial knowledge gaps, and governance issues, form a complex series of interconnected problems. Addressing such difficulties needs comprehensive and sustained efforts, making progress slower than expected.

In the context of Laos, cultural and organizational resistance to change might limit the successful adoption of guideline approaches from the FIRM. The fear of the unknown, prevalent in societies with a strong cultural identity, may further hinder the acceptance of new strategies.[27] If VF management and local officials are hesitant or opposed to strategies, the impact of proposed interventions may be limited. At the same time, poor coordination among stakeholders participating in the implementation of the roadmap might lead to disjointed efforts. A coherent and collaborative strategy is necessary for resolving these difficulties faced by VFs.

To advance progress and enhance the effectiveness of the goal to strengthen VFs, it is essential to reinforce capacity-building and training efforts. Prioritizing comprehensive programs for VF supervisors and management teams is crucial. These programs should cover financial management, governance principles, and operational best practices, to empower VF

[27] Laos has many ethnic groups, with the government identifying 149 ethnic groups among the country's 47 main ethnicities. The Lao Front for National Construction's (LFNC) most recent revision of this list included 49 categories and over 160 subgroups (Asian Development Bank 2006).

supervisors and management teams (NSOs and LWU) with the necessary skills. Moreover, establishing a robust monitoring and evaluation framework is important. Stakeholders should continuously assess intervention impacts, with regular evaluations offering insights into effectiveness and identifying areas needing adjustment or further attention. Importantly, recognizing the dynamic nature of challenges, an adaptive implementation approach is necessary. Regularly reassessing intervention effectiveness and being flexible in adjusting strategies based on evolving circumstances and feedback will speed up progress.

In addition, promoting community engagement and awareness programs becomes crucial to ensure contributions from all stakeholders at central and local levels in Laos. Building understanding and support at the local level can overcome resistance and foster a sense of ownership in the success of VFs. Also, ensuring consistency in collaborative partnerships between government agencies, NGOs, and international entities is vital. Pooling resources, expertise, and support can increase the collective impact of interventions, accelerate progress, as well as achieve the main goal of strengthening VFs for financial inclusion in Laos.

2.6. Microfinance institutions

MFIs in Laos have shown substantial growth despite starting from a limited foundation. The primary drivers for this growth are both DTMFIs and NDTMFIs[28] Although initially

[28] As outlined in the regulatory framework, specifically Article 2 of the regulation on non-deposit microfinance supervision (No. 02/BOL, dated 20 June 2008), a NDTMFI is a financial institution licensed by BOL for business operations. However, it is restricted from accepting deposits from the general public. Furthermore, the definition of NDTMFI, as specified in the decree on microfinance (No. 460/GOV, dated 03 October 2012), characterizes it as a financial institution that offers microloans and other micro-financial services. On the other hand, a DTMFI is described as a financial institution with the capability to accept deposits from the general public, in addition to providing microloans and other micro-financial services.

concentrated in urban areas,[29] these MFIs are progressively extending their services to rural regions (FinMark Trust 2015). As of 2021, 120 MFIs are operated in Laos, comprising 20 DTMFIs and 100 NDTMFIs. The combined assets of these MFIs amounted to LAK 2,355 billion. Particularly, their deposits reached LAK 1,558 billion, with total loans extended to LAK 1,525 billion (Bank of the Lao PDR 2021). This demonstrates both the expansion of MFIs into diverse geographical areas and the notable financial activity within the microfinance sector in this country.

In Laos, like other developing countries, microfinance has the potential to make a life-or-death difference for people who are poor and disadvantaged. It enables them to initiate income-generating endeavours and manage their household expenses more effectively (Sayvaya and Kyophilavong 2015). Although the assets and credits to GDP of MFIs in Laos may seem insignificant compared to commercial banks, it is important to recognize that financial inclusion is not solely about the size of financial products and services. It is more about providing the underbanked and those with fewer opportunities the chance to access and leverage reliable formal finance.

MFIs in Laos emerge as a more fitting choice for financial inclusion when compared to VFs. These institutions excel in crucial areas such as effective management, financial and accounting expertise, adherence to legal and financial-sector regulations, robust oversight by BOL, the capacity to provide reliable performance data, and meeting essential regulatory reporting requirements vital for monitoring. The strengths of MFIs compared to VFs, enable

[29] The majority of MFIs in Laos, accounting for 59%, are situated in the capital city of Vientiane. The remaining 41% of MFIs are spread across various provinces in the country (Bank of the Lao PDR 2021).

them to deliver accessible, responsible, and sustainable financial services to underserved populations in Laos, thereby contributing to greater financial inclusion in the country.

Furthermore, MFIs can be a better solution for financial inclusion compared to commercial banks, as they can reach excluded populations and offer simple products and services. MFIs focus on underserved areas where commercial banks are unable or unwilling to provide services. This means that MFIs can reach populations that are excluded from the formal financial sector. Additionally, MFIs also offer simple and straightforward financial products and services, which can be easier to understand and use. This is particularly important for low-income and marginalized populations that may not meet the strict requirements of commercial banks.

Since Laos has a large unbanked population, commercial banks have not been able to meet the needs of low-income and marginalized populations. The rise of MFIs has had a significant impact on financial inclusion in the country. These institutions have been able to reach populations that were previously excluded from the formal financial sector by offering a range of financial services, including microloans, savings products, and insurance. MFIs that consist of DTMFIs and NDTMFIs have a credit-to-deposit ratio of 98%. The elevated credit-to-deposit ratio observed among MFIs in Laos underscores their significant role in advancing financial inclusion.

By providing access to finance for those who are underserved by traditional banking services, MFIs are helping to reduce poverty, promote economic growth, and improve social outcomes. The growth in deposit and credit of MFIs in recent years is a clear indication of the increasing demand for their services and access to formal finance. According to the statistics illustrated in Table 4, MFIs showed significant growth in deposits by 720% and in credit by 637%, which is significantly higher than commercial banks' growth rates in deposits and credit.

Furthermore, it is important to highlight that the number of overall MFIs has had a remarkable increase of 173% since 2014, going from 44 institutions to 120 in 2021.[30] These figures are in totally contrast to the growth in the number of commercial banks, which only increased from 37 banks to 44 during the same period. Hence, this significant expansion of MFIs highlights their important role in promoting financial inclusion, especially among low-income and marginalized communities.

Table 4. The rise of financial intermediation in Laos

In billion LAK

Formal financial institutions	2014	2021	% Growth
Commercial banks			
Number	37	44	19%
Deposits	45,995	128,149	179%
Credits	40,295	87,298	117%
Credit-to-deposit ratio	88%	68%	
MFIs			
Number	44	120	173%
Deposits	190	1,558	720%
Credits	207	1,525	637%
Credit to deposit ratio (MFIs)	109%	98%	

Source: Bank of the Lao PDR and Financial Institution Supervision Department

Moreover, it is worth noting that MFIs operate under a distinct regulatory framework compared to commercial banks. Guided by Decree No. 460/GOV, dated 03 October 2012 on microfinance, MFIs in Laos primarily serve low-income individuals, micro-entrepreneurs, and those lacking access to formal banking services. Additionally, implementation guidelines outlined in microfinance decree No. 01/BOL, dated 19 April 2016, specify that micro-loans provided by MFIs must not exceed LAK 50 million. Consequently, MFIs specialize in offering

[30] This significant increase can be attributed to MFIs' capacity to cater to the requirements of low-income individuals who face barriers accessing commercial banks and those who are wary of the instability and inefficiency of VFs.

small, microcredit loans tailored to the financial needs of borrowers seeking relatively modest capital for income-generating activities and household expenses. One aspect of MFIs is their minimal collateral requirements for microloans. This streamlined approach simplifies documentation and loan approval procedures. In terms of savings, while commercial banks offer a broad range of savings and deposit products,[31] MFIs provide savings accounts under microfinance regulations and their savings services are designed to be simpler and more accessible to low-income individuals, with a focus on promoting savings as part of broader financial inclusion efforts. Therefore, with their unique business models, MFIs are well-positioned to continue playing a key role in creating economic opportunities for individuals and businesses that were previously excluded from banks and the formal financial system.

2.7. Concluding remarks

Laos faces a significant challenge with a substantial portion of its population being unbanked and underbanked, hindering economic growth and social mobility. Despite the efforts of the government and stakeholders, there are various obstacles on both the demand and supply sides that are impeding progress towards achieving financial inclusion in the country. Demand-side barriers are influenced by factors like the level of financial literacy,[32] geographic location, gender disparities, and income inequality.

To tackle these issues, the Lao government has introduced the 9th Five-Year National Socio-Economic Development Plan (2021-2025). This plan emphasizes aligning poverty

[31] Including savings accounts, certificates of deposit (CDs), and various investment options.
[32] Financial inclusion must be accompanied by efforts to promote financial literacy in order to address the cultural norms that govern the borrowing, spending, saving, and general financial behaviour of many individuals (Chibba 2009).

alleviation and development efforts with the Sam Sang Directive.[33] It also places a high priority on creating job opportunities and promoting a fairer distribution of income, particularly to bridge the gap between affluent and disadvantaged populations and between urban and rural areas. The central focus is on ensuring access to essential services, including finance, education, healthcare, clean water, electricity, transportation, telecommunications, the internet, and other public amenities in remote areas. Additionally, the Lao Government has finalized the drafting of the Gender Equality Law, which was approved by the National Assembly in 2019 and enacted through a Presidential Decree in 2020. This law aims to promote gender equality, with the goal of increasing the Gender Equality Index from 0.927 in 2019 to 0.984 by 2025. However, Laos still fights with disparities related to location, gender, and ethnicity, which present challenges to both human capital development and income equality (Lao PDR 2021). Notably, the Gini coefficient, a measure of income inequality, increased from 36.0 to 38.8 in 2019 (Lao Statistics Bureau and World Bank 2020).

In terms of financial inclusion efforts, empowering consumers through financial education and protection is essential to ensure they fully benefit from financial services. Financial literacy should equip consumers with a better understanding of financial products, protect them from harm, and reduce the risks of over-indebtedness (Finmark Trust 2016). Within the implementation of the FIRM plan, which emphasizes improving financial literacy (see Table 5),[34] the government and stakeholders are focusing on activities to ensure formal

[33] The Sam Sang Directive, also known as the Three-Builds Directive, translates into action the resolutions N0. 03 and 25 from the Political Bureau of the Party Central Committee, as well as Government Order No. 34/PM. These documents provide guidance, objectives, and strategies for developing provinces as strategic entities, enhancing the competence of districts, and fostering the growth of villages that convert large villages into smaller towns.

[34] It assesses each planned activity and classifies them into four categories based on their current status:1 = Fully achieved activities; 2 = Activities that are partially achieved or in progress; 3 = Activities that have not been achieved; 4 = Activities with an unclear status.

Financial Service Providers (FSPs) comply with reporting regulations and publish financial-sector statistics. There has been progress in this regard, with ongoing efforts for compliance. Additionally, FSPs are encouraged to actively promote financial literacy among their customers by integrating financial education into their services. This initiative is currently in progress, with FSPs making efforts to enhance financial literacy among their customers. Furthermore, the FIRM framework aims to integrate financial literacy education into the formal education system, but progress in this area is slower, indicating that full integration into the formal education system remains a work in progress.

Table 5. Examination of FIRM implementation on financial literacy

Intervention	Activities	Status of each planned activity
Financial literacy	Ensure that all formal FSPs report publicly, consistently and timely in accordance with legal requirements and that all relevant financial-sector statistics are regularly published	2
	Encourage FSPS to develop financial literacy amongst their customers	2
	Aim to integrate learning on financial literacy into the education system	3

Source: UNCDF 2021

Addressing demand-side challenges, which may be challenging to fully resolve, requires targeted policies and interventions aimed at improving financial literacy, reducing gender and income disparities, and enhancing access to formal financial services in both urban and rural areas.

On the supply side, improving financial inclusion in the country faces challenges, particularly the lack of attention from commercial banks. Efforts to address this issue have been initiated through the implementation of policies and activities under the FIRM framework. These initiatives aim to incentivize banks and other financial service providers to expand their

physical presence and tailor their products for better accessibility to low-income households. Shifting the focus of banks from urban areas and higher-income customers to under-served segments can significantly enhance access to banking services, offering a broader range of financial options for those in need.

Despite these efforts, the assessment of the FIRM plan indicates varying levels of progress in different priority areas. None of the planned activities have been successfully completed, and some are still in progress (see Table 6). For instance, the activity aimed at removing regulatory barriers hindering the establishment of new bank branches, typically involving additional capital requirements, remains unresolved, signaling that this objective has not been achieved.

Table 6. Activities and status to outreach banks and other financial institutions

Intervention	Activities	Timeframe	Status of each planned activity
Products	Remove regulatory barriers to the establishment of new branches by banks, MFIs and leasing companies, such as additional capital requirements	Medium	3
Regulatory	More innovation in product design, moving beyond traditional products, to those more suitable for low-income households	Medium	2
Developmental	Financial institutions need to be more innovative in extending distribution networks through branches and non-branch channels	Long	2
	Investigate the potential for branchless banking using independent (third-party) agents, such as retail stores, who would provide banking services on behalf of banks.	Long	2
	Consider strategic alliances between banks and MFIs for better outreach	Long	3

Source: FinMark Trust 2016 and UNCDF 2021

Similarly, the objective to encourage banks to innovate in product offerings for low-income households indicates ongoing progress. On the other hand, activities such as forming strategic partnerships between banks and MFIs to improve outreach have not materialized, reflecting that this objective has not been achieved.

To address this situation more effectively, the government can consider implementing specific measures. One approach is to create targeted incentives for banks to expand services in underserved areas. This could involve implementing incentive programs, such as tax benefits, reduced regulatory requirements, and direct financial support, to encourage banks to establish branches in remote locations. Streamlining regulatory processes for opening new bank branches is another crucial step, ensuring that requirements are clear and achievable. By reducing bureaucratic barriers, banks may be more motivated to extend their reach to areas with limited access to financial services.

Additionally, engaging banks in dialogues and collaborative efforts with MFIs is also a strategic move.[35] Joint initiatives can leverage the strengths of both entities, leading to more effective financial inclusion efforts. Strengthening facilitation through a dedicated platform or committee, incentivizing collaboration, conducting training programs for both banks and MFIs and establishing clear, shared goals and key performance indicators for collaborative initiatives are additional measures that can enhance the effectiveness of partnerships.

These comprehensive steps can contribute to a more inclusive financial landscape, ensuring that banking services are accessible to a wider population. In addition, the government

[35] There are a few commercial banks in Laos that have established MFIs as subsidiaries, such as BIC Bank Lao Co.,Ltd, which has established BIC MFI, and Joint Development Bank, which has founded SimoungNgenduan MFI.

can create a conducive environment for banks to actively participate in financial inclusion efforts.

Furthermore, addressing the supply-side challenges in Laos involves dealing with the underperformance of informal finance options, particularly VFs. The FIRM plan, aimed at enhancing the sustainability of VFs, has been implemented. However, the assessment of its impact reveals uneven progress across different priority areas. Out of nine outlined activities, only one has been fully achieved, three are in progress, and five remain unaccomplished or unclear in their status. Despite targeted efforts, the existence of challenges in VFs raises concerns about the slow progress in strengthening these funds. Therefore, overcoming these challenges requires a comprehensive and diverse approach. Emphasizing capacity building, continuous monitoring, community engagement, policy support, and collaborative partnerships offers the potential to advance progress and achieve the overarching goal of reinforcing VFs for financial inclusion in Laos.

In promoting financial inclusion in Laos, MFIs outperform VFs due to their stronger management, regulatory compliance, and ability to provide reliable services. Additionally, MFIs are a superior choice for financial inclusion compared to commercial banks. They reach excluded populations, offer simple services, and are accessible to those left out of the formal financial system. Over recent years, the microfinance sector in Laos has experienced substantial growth. However, government and stakeholder support for removing regulatory barriers hindering the establishment of new branches by MFIs is still a work in progress (UNCDF 2021). To continue serving low-income and unbanked populations in both urban and rural areas, there is a need for MFIs to enhance efficiency, reduce implementation costs, and mitigate risks while simultaneously promoting financial inclusion.

The government of Laos places a high priority on developing the digital economy[36] and recognizes the potential of fintech in promoting financial inclusion and economic growth (Sengpunya 2019). This commitment is reflected in the 9th Five-Year National Socio-Economic Development Plan (2021-2025), where the government emphasizes financial inclusion, eco-friendly technologies, advanced ICT infrastructure, and empowering its citizens to harness digital opportunities. Their strategic focus also includes enhancing the performance of financial institutions, enacting financial security legislation, and modernizing infrastructure to support the shift to a digital economy (Lao PDR 2021). Initiatives efforts to improve effectiveness and manage risks[37] associated with expanding access to affordable financial products and services for vulnerable individuals and businesses are paramount. By proactively addressing these challenges, Laos has the potential to significantly enhance financial inclusion. This, in turn, will create economic opportunities for those currently excluded from financial services and have a positive social impact on the country.

Given that MFIs serve vulnerable individuals and businesses, it becomes crucial to assess their financial health and the potential risks associated with providing financial services to these groups. Thus, the next chapter of this dissertation focuses on assessing the performance of MFIs and the credit default risk. This exploration is important as it can influence the stability of MFIs and their ability to effectively facilitate sustainable financial inclusion.

[36] The essence of the digital economy lies in the 'digital sector,' encompassing the IT/ICT industry that creates fundamental digital goods and services. The authentic 'digital economy' refers to the portion of economic output primarily or exclusively generated through digital technologies, operating on business models based on digital goods or services (Bukht and Heeks 2018).

[37] Technological solutions, such as fintech, hold tremendous potential in this regard by helping financial institutions reduce transaction costs, increase transparency, manage risk efficiency, and expand impact by offering affordable financial products and services to the underbanked (Beck et al. 2009; Moro-Visconti 2021; Banna et al. 2022).

Chapter 3. Examination of MFI's performance and credit default risk

3.1. Background and literature reviews

The microfinance sector has seen remarkable growth in Laos, with MFIs having outpaced commercial banks with an impressive surge in deposits and credit, highlighting their crucial role in promoting financial inclusion for low-income and marginalized populations. However, this growth could pose a danger to MFIs' performance and credit default risk. This risk is associated with providing loans to clients who are vulnerable groups that are often excluded from the formal financial system. Therefore, enhancing the efficiency of MFI performance and reducing credit default risk is essential for MFI stability, depositors' financial security, and the long-term support of financial inclusion.

Measuring the performance of MFIs is complex and multidimensional, which makes it difficult to establish consistent associations between governance structures and their performance. However, the study by Beisland et al. (2014) proposes using microfinance rating scores as a summary performance metric to assess governance structures' impact on microfinance performance. The study finds that CEO/Chair duality has a negative relationship with rating scores, while the number of international board directors, the presence of internal auditors, and the level of competition intensity have a positive association with rating scores. These findings can be helpful in an industry where there is no established standard for governance mechanisms.

Furthermore, the study by Bogan (2012) goes beyond the life cycle theory to examine how capital structure affects the performance of MFIs. Using panel data for 2003 and 2006 on MFIs in Africa, East Asia, Eastern Europe, Latin America, the Middle East, and South Asia. It finds that MFI performance is linked to their asset size and capital structure, and the use of

grants has a negative impact on sustainability and operational self-sufficiency. To expand their microloan portfolios, increase sustainability, reach more people, and reduce lending rates, MFIs must adopt a commercial approach that attracts the capital and savings base they need. To address capital constraints, larger MFIs may require smart subsidies or innovative financing tools. Another study conducted by Zamore (2018) examines how revenue diversification affects the financial performance of MFIs and finds that diversifying revenue streams can enhance the stability and cost-effectiveness of MFIs. The research is conducted based on MFIs' global sample, to determine the best strategy for these institutions, considering the conflicting views on diversification. While modern portfolio and banking theories support the idea of diversification, agency theory opposes it. Agency theory argues that diversification may be harmful to a firm's value, suggesting that concentrating investments in specific areas is a better approach.[38] However, the results show that MFIs benefit from diversification, and thus, the study recommends that microfinance practitioners should consider expanding their operations.

Several studies focused on the relationship between MFIs' performance and social impact. For example, Bassem (2012) investigated how MFIs balance their financial and social goals, and explored the link between financial performance and outreach in 64 institutions in the Middle East and North Africa region during 2008-2010. The findings imply that there is a trade-off between financial performance and minimizing portfolio risk, but no indication of mission drift.[39] Hence, MFIs can effectively attain both financial and social aims. In addition,

[38] Agency theory focuses on the relationship between principals (like shareholders) and agents (such as managers) and explores ways to address conflicts of interest between them (Eisenhardt 1989). In the context of diversification, agency theory could suggest that managers, in their role as agents, may have their own incentives that are not aligned with the best interests of shareholders. For example, they might prefer a less diversified portfolio that could offer them higher short-term profits, even if it means exposing shareholders to increased risk.

[39] This implies that when MFIs prioritize maximizing their financial returns, they might need to take on higher levels of portfolio risk. On the other hand, when they focus on reducing the risk in their portfolios, their financial performance might be negatively affected. Interestingly, the study did not

the study by Louis et al. (2013) examined how financial self-sustainability and social efficiency are interrelated in MFIs. The authors analyze a comprehensive dataset of 650 institutions and use a self-organizing map methodology to investigate the existing heterogeneity among them. The study's findings reveal that there is no trade-off between social efficiency and financial performance, and instead, a positive relationship exists between these two factors.[40] Moreover, Boehe and Barin Cruz (2013) examined the impact of female participants in MFI on debt repayment performance. By analyzing qualitative and quantitative data from 26 microfinance projects in 22 countries across Africa, Eastern Europe, Latin America, and Asia. It suggests that the presence of women in MFIs can improve their overall performance, particularly when faced with difficult cognitive and regulatory institutional conditions. Additionally, to find out how the condition of social beliefs affects the MFIs' performance, Burzynska and Berggren (2015) used panel data from 2003 to 2011 to evaluate 331 MFIs from 37 countries. The research shows that interest rates, operational expenses, and default rates are all lower for MFIs in nations with a more trusting and collectivist society.

There is criticism that microfinance has received from the public and media due to the microcredit crisis that occurred in 2010 in Andhra Pradesh, India, which resulted in microfinance-induced suicides. The study by Galema et al. (2012) argues that weak corporate governance and imprudent risk-taking can have significant consequences. The results of the study, based on a sample of 280 MFIs, suggest that powerful CEOs of microfinance NGOs have more decision-making freedom, which leads them to make more extreme decisions that increase

find any indication of "mission drift." Mission drift refers to a situation where MFIs start to deviate from their primary social mission of serving the underserved and financially excluded populations. The research findings suggest that, in the studied context, MFIs were able to strike a balance between their financial goals and social objectives without compromising their core mission.

[40] The study challenged a prevailing notion that MFIs must choose between financial sustainability and social impact. Instead, its findings indicated that these two aspects can complement each other and even contribute to each other's success.

risk. Moreover, this decision-making freedom appears to lead to worse decisions and lower performance in microfinance NGOs. Regarding the culture of MFIs, the study by Joseph and Kibera (2019) examined how the performance of MFIs in Kenya is influenced by their organizational culture. A descriptive cross-sectional survey design was used, where data was collected from both primary sources (structured questionnaires answered by the CEO, human resource manager, and marketing manager) and secondary sources (annual reports). Factor analysis and hierarchical regression were employed to analyze the data. The results showed that clan and hierarchy were the most prevalent cultural typologies in the microfinance industry. The study found that organizational culture has a significant impact on non-market performance and that market culture has an inverse correlation with the debt/equity ratio. The research concludes that organizational culture plays a significant role in creating a sustainable competitive advantage in the microfinance industry, and market culture supports long-term financial independence and sustainability.

The assessment of MFIs has been extensively researched, with financial and social performance being the main goals. The study by Akter et al. (2021) conducted a literature review using bibliometric analysis. The study analyzed 1,252 scientific documents indexed in Scopus from 1995 to 2020, and the findings indicate an increasing trend in publications, especially from 2006. Various bibliometric indicators were used to track the progression of knowledge, and the most impactful authors, publication sources, institutions, and countries were identified. The major research themes identified included poverty alleviation, group lending, credit scoring, and microfinance or microcredit. Furthermore, the analysis of thematic evolution revealed that financial performance is receiving more attention in recent research regarding the assessment of MFI performance.

In assessing the performance of MFIs, various financial indicators have been used in previous literature, such as asset size and capital structure, financial self-sustainability, and rating score. However, the majority of those studies have not examined the performance of MFIs based on the CAMELs rating ratio.[41] CAMELs rating ratio is one technique that has gained recognition for assessing the performance of financial institutions (Hirtle and Lopez 1999; Barr et al. 2002; Sarker 2005; Balasundaram 2008; Christopoulos et al. 2011). This rating system is a tool to evaluate the safety and soundness of financial institutions as a rising number of MFIs are utilizing the method to present different financial indicators, such as adequacy of capital, quality of assets, management, earnings, and liquidity (Tucker and Miles 2004). The study by Brockett et al. (1997) discussed the components of a CAMELs rating ratio, which are necessary for assessing the stability and risks of financial firms. The first component, Capital Adequacy, provides a buffer against fluctuations in earnings and reassures stakeholders that the organization can continue to provide financial services. The second component, Asset Quality Rating, evaluates the present and future condition of a firm's assets and assesses its ability to manage credit risk, as well as prevent the default risk that could impact its financial condition. The third component, Management, assesses a firm's ability to diagnose and respond to financial stress and is based on objective indicators. The fourth component, Earnings, measures a firm's continued viability and ability to fund expansion, remain competitive, and replenish or increase capital. The fifth component, Liquidity, assesses the institution's ability to meet its short-term financial obligations without disrupting its operations. The final component,

[41] The choice of performance measurement method for MFIs can be influenced by factors such as data availability, resource limitations, and research objectives. While the CAMELs rating system is a tool for evaluating MFIs, past researchers have opted for alternative measurement methods that align with their particular research requirements and constraints.

Sensitivity to Market Risk, was added in 1995 to address interest rate risk and involves examining hypothetical future price and rate scenarios to model their effects. This forward-looking approach is more variable than classic ratio analysis and is used to assess a firm's sensitivity to unexpected shifts in interest rates and other market conditions.

In Laos, the financial regulator (BOL) employs the CAMEL rating system to oversee the operations of MFIs in accordance with regulatory guidelines outlined in document No. 870/BOL dated 14 November 2022. This framework sets financial ratios to ensure the stability of both DTMFI and NDTMFIs. The CAMEL ratios serve as a tool for assessing the financial efficiency and risk of MFIs, identifying areas of weakness, and determining the need for corrective actions. This chapter adopts the CAMEL to evaluate MFI performance and credit default risk, allowing us to gain a comprehensive understanding of their overall financial health when extending loans to underserved populations. By exploring these aspects, this chapter seeks to contribute insights to the existing literature on the performance of MFIs.

The upcoming section delves into a detailed analysis of MFI's performance. This examination covers the MFI's ability to absorb losses and maintain solvency, as well as measures of profitability and cost-effectiveness. Additionally, we assess credit default risk by examining non-recoverable loans resulting from defaults or delinquencies and evaluating overdue loans with a potential risk of default. Finally, Section 3.3 concludes the implications of the study.

3.2. Performance and credit default risk of MFI in Laos

MFIs have a significant impact on advancing financial inclusion in Laos. However, the performance of these institutions can vary widely, depending on factors such as governance and risk management. To assess the performance of MFIs in Laos, we have employed the CAMEL

rating system, as the guiding principle for evaluating financial institutions.[42] The information on MFIs in this chapter was obtained from the Financial Institution Supervision Department (FISD), which is the primary regulatory body under BOL in charge of overseeing MFIs in Laos. The data set includes 86 MFIs that can provide an accurate financial report to FISD. This data is recognized as the same information used by the regulatory authority to monitor and regulate MFIs.

We leverage a set of comprehensive indicators to assess the overall performance of MFIs in Laos. These indicators include the Capital adequacy ratio (CAR), assessing the MFI's capacity to absorb losses and maintain solvency over time. Additionally, we utilize Return on equity (ROE) and Return on assets (ROA) as measures of profitability, shedding light on the institution's financial success. Operational efficiency (OE) is used as a metric to evaluate cost-effectiveness. To specifically evaluate the credit default risk, we employ two distinct indicators such as the Write-off (WO), measuring non-recoverable loans resulting from defaults or delinquencies, and Portfolio at risk (PAR), assessing overdue loans with a potential risk of default. The integration of these indicators, as detailed in Table 7, provides an understanding of the financial viability, profitability, efficiency, and credit default risk of MFIs in Laos.

Table 7. The CAMEL measures MFI's performance and credit default risk

Ratios	BOL standard	Average results of 86 MFIs
Capital adequacy (CAR)	> or = 12%	160.3%
Return on equity (ROE)	> or =5%	0.2%
Return on assets (ROA)	> or =2%	0.9%
Operational efficiency (OE)	< or =30%	57%
Write-off (WO)	< or =2%	5.4%
Portfolio at risk (PAR)	< or =5%	13.5%

Source: Bank of the Lao PDR and Financial Institution Supervision Department

[42] Bank of the Lao PDR also employs the CAMEL principle to supervise MFIs in the country. This measure criterion is in accordance with the regulation on financial ratios to maintain the stability of DTMFIs and NDTMFIs, No. 870/BOL dated 14 November 2022.

3.2.1. Capital adequacy ratio (CAR)

CAR of an MFI plays a crucial role in safeguarding against potential risks and influencing significant decisions related to growth. As per regulatory guidelines established by the regulator (BOL)[43] through CAMEL parameters, all MFIs are required to maintain a minimum capital-to-risk-weighted assets ratio of 12%. Failure to meet this minimum threshold places an MFI in non-compliance, prompting further examination by regulators to ascertain the reasons for the low capital level and the measures being taken or planned to comply with the minimum requirements.

The CAR is calculated using the formula:

$$\text{CAR} = \frac{\text{Tier}_1 + \text{Tier}_2}{\text{RWA}}$$

where Tier 1 Capital encompasses paid-in capital, regulatory reserves, undivided earnings, and accumulated operating profit (loss) from previous financial years. Tier 2 Capital includes Tier 1 components along with a 1% general reserve in the provision for loan loss, 50% of the revaluation reserve, and net profit or loss from the current operating year. Risk-weighted assets (RWA) are determined based on various categories, with different percentages assigned to assets such as cash on hand, deposits in banks supervised by BOL, government paper with maturity of less than 1 year, and other investments.

According to the regulator's ratio analysis results, the average MFIs in Laos have CAR of 160.3%, indicating strong capital stabilities. This ratio also indicates that these institutions are generally well-prepared to deal with possible risks and pursue growth. However, it is

[43] Under the financial ratios to maintain the stability of DTMFIs and NDTMFIs, No. 870/BOL dated 14 November 2022.

important to note that BOL sets minimum CAR requirements to ensure the stability and solvency of MFI. If MFI's CAR falls below the regulatory minimum or has a negative CAR, it may be subject to corrective measures or regulatory actions to address the capital shortfall. This situation indicates that the MFI lacks sufficient capital to cover its risk exposures, potentially signaling financial instability and a heightened risk of insolvency.

A potential cause of a lower CAR could be an increase in the write-off (WO) within MFI. However, MFI must aim to enhance their CAR to maintain transparency and not conceal WO from regulators. Previous studies have highlighted that WO can impact regulatory capital ratios. Kim and Kross (1998) argue that if financial institutions reduce WO to bolster capital, there may be a subsequent rise in WO. A decrease in WO contributes to an increase in CAR, but loans deemed uncollectable and not written off will eventually need to be addressed, leading to a decline in CAR. Thus, the relationship between WO and CAR underscores the importance of prudent and transparent financial management practices for MFI.

Addressing a fall below the regulatory minimum CAR requires immediate and comprehensive actions by MFI, involving the measures of financial, operational, and strategic, and collaboration with regulatory authorities (BOL) to ensure a successful recovery. It can start with conducting a thorough assessment to identify the factors contributing to the issue of CAR, whether it be a decline in capital or an increase in risk-weighted assets. One potential solution is to consider raising additional capital through various resources, such as issuing new shares, seeking investments, or securing loans. This can strengthen the MFI's financial foundation and improve the CAR. Simultaneously, MFI should evaluate the risk profile of its asset portfolio, considering the sale of non-performing or risky assets to the debt management company or debt purchasing services centre of BOL to reduce risk-weighted assets. In addition, cost-cutting

measures should also be implemented to enhance operational efficiency, identifying areas for expense reduction without compromising essential functions.

More importantly, conducting stress testing and enhancing monitoring mechanisms are critical steps to identify and mitigate potential risks of MFI. For instance, financial institutions are required to establish robust stress-testing procedures for evaluating their capital adequacy. These testing processes should include the identification of potential changes in financial conditions that may negatively influence an institution's likelihood of default (Gallati 2003). Moreover, proactive engagement with regulatory authorities is crucial, with transparent communication about the situation and discussions regarding potential solutions. Gallati (2003) further argues that the regulator is responsible for assessing how effectively financial institutions evaluate their capital adequacy in relation to their risks. This internal evaluation process would undergo scrutiny by the supervisor, and intervention would occur when deemed necessary. So, the adoption of these recommendations will often necessitate a more comprehensive and detailed discussion between regulators and MFI.

In the real situation, BOL conducts off-site analyses[44] to evaluate key indicators, such as the CAR, and assess the overall financial health of MFIs in Laos. If any issues are identified during this off-site analysis, BOL promptly initiates urgent or emergency on-site evaluations, typically conducted annually. This on-site inspection[45] is crucial for thoroughly investigating identified problems.

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[44] Off-site supervision is a continuous process that consists of two types of activity: monthly checks based on the MFI's monthly reports and overall assessment of an MFI for a specific year based on audited annual financial statements.

[45] During on-site inspections, BOL officials visit MFI branches to conduct a comprehensive examination. This involves scrutinizing documents related to operations, compliance, and customer interactions. Additionally, BOL reviews loan documents, client agreements, and internal policies to gain insights into decision-making processes, risk management strategies, and overall governance. Direct meetings with key executives, board members, and management teams further facilitate a comprehensive understanding of the institution's practices.

3.2.2. Return on equity (ROE)

ROE ratio assesses how well financial institutions generate income from their own capital, calculated by dividing the profit after taxes by the average equity:[46]

$$\text{ROE} = \frac{\text{Profit after taxes}}{\text{Average assets}}$$

A higher ROE illustrates that a financial institution is making better use of its capital (Balasundaram 2008; Christopoulos et al. 2011; Nguyen, Nguyen, and Pham 2020). According to BOL prudential regulations, each MFI must maintain a minimum ROE of 5%.

Based on the BOL's ratio analysis, MFIs in Laos have an average ROE of 0.2%. This significantly low average suggests that these MFIs are having difficulty efficiently utilizing their capital to earn profits. Possible explanations include operational inefficiencies or poor financial management. A low ROE could lead to decreased financial stability and difficulties in covering operational costs.

It is important to note that the BOL's minimum ROE requirement of 5% is not met by Laos' MFIs. This raises concerns about the specific challenges that these institutions face in Laos. Meanwhile, a comparison with other developing countries reveals similar difficulties. MFIs in Ethiopia, for example, have had an average ROE of 3% (Kereta 2007). The average ROE of MFIs in the Middle East and North Africa is 14.34% (Bassem 2012), while it is 11.31% in India (Rupa 2015). This suggests that low ROE is a problem in some developing countries, and Laos is relatively low, indicating potential issues in the microfinance sector that extend beyond specific national contexts.

[46] The average equity = ([Equity at the beginning of the period + Equity at the end of the period]/2).

Understanding the Laotian context will be critical in developing targeted strategies and interventions to improve the financial performance of MFIs in the country. To improve ROE, MFIs should prioritize borrowers' creditworthiness, loan terms, and interest rates of lending. The low ROE witnessed in Laos could be attributed to factors such as high operating costs and inefficiencies. As a result, it is recommended that MFIs implement measures aimed at improving operational efficiency and financial management practices to overcome these challenges.

3.2.3. Return on assets (ROA)

ROA ratio measures the effectiveness of asset management in generating profits, calculated by dividing the profit before taxes by the average assets:[47]

$$\text{ROA} = \frac{\text{Profit before taxes}}{\text{Average assets}}$$

This metric assesses how efficiently financial institutions use their resources, with a higher ROA reflecting better resource utilization (Nguyen, Nguyen, and Pham 2020). Under BOL prudential regulations, every MFI is required to maintain a minimum ROA of 2%.

The ratio analysis conducted by BOL indicates an average ROA of 0.9% among MFIs in Laos. This shows on average, these MFIs are falling below the essential minimum ROA requirement set by BOL. Failing to meet this mandated criterion may pose challenges for MFIs. ROA is a crucial indicator of an institution's asset profitability in generating income (Roman and Şargu 2013). Insufficient profitability can lead to an MFI struggling to cover expenses, including loan losses and operational costs, indicating a potential inability to sustain current and future operations (Balasundaram 2008). Furthermore, ROA, as a measure of financial

[47] The average assets = ([Assets at the beginning of period + Assets at the end of the period]/2).

performance, is positively correlated with customer service quality (Elizabeth and Ellot 2004). A low ROA for an MFI may constrain its ability to expand services, and offer competitive products, and could impact the quality and accessibility of financial services provided to clients.

The problem of low ROA is not unique to Laos; it is a global challenge faced by MFIs. For example, a study involving 278 MFIs in 60 countries discovered an average ROA of 1.5% (Mersland and Øystein Strøm 2009). In India, the average ROA is reported to be 0.9% (Rupa 2015), while in Bangladesh, it is 2.7% (Parvin et al. 2020). Even within the ASEAN-4 countries of Cambodia, Indonesia, the Philippines, and Vietnam, MFIs had an average ROA of 2.9% (Hien 2009). The Asia-Pacific region as a whole has an average ROA of 2.8% (Lebovics, Hermes, and Hudon 2016). Furthermore, the issue of ROA extends beyond Asia. For instance, Central African MFIs report a -0.6% ROA, East African MFIs show an ROA of 3.4%, the Indian Ocean region reports a -3.3% ROA, Southern African MFIs illustrate a -9.7% ROA, and West African MFIs report a 1.7% ROA (Lafourcade et al. 2005).

Similar to the challenges faced with low ROE, the causes of low ROA could include high operating costs and inefficiencies. Addressing these challenges is vital for MFIs to enhance both ROE and ROA. Measures to improve operational efficiency and financial management practices should be prioritized to overcome these issues. Additionally, focusing on factors such as borrower creditworthiness, loan terms, and repayment schedules can contribute to improving both ROE and ROA, fostering financial stability and inclusive growth.

3.2.4. Operational efficiency (OE)

The OE of a MFI is critical for the effective provision of microfinance services, ensuring a balance between operational costs and productivity. According to regulatory guidelines established by BOL through CAMEL parameters, all MFIs are obligated to maintain OE within

a limit, not exceeding 30%. The OE is calculated by dividing operating expenses by the average total loan portfolio:[48]

$$\text{OE} = \frac{\text{Operating expenses}}{\text{Average total loan portfolio}}$$

The regulatory standard serves as a benchmark for prudent financial management within MFIs, and recent data show a concerning deviation in OE among Laotian MFIs. The average OE is 57%, which exceeds the Central Bank's regulatory limit. When compared to other MFIs in the region, Laotian MFIs have a significantly higher OE. MFIs in the ASEAN-4 countries, such as Cambodia, Indonesia, the Philippines, and Vietnam, report an average OE of 26% (Hien 2009). Similarly, a broader study involving 278 MFIs from 60 countries found an average OE of 31% (Mersland and Øystein Strøm 2009). Consequently, MFIs in Laos could have a notable inefficiency in resource utilization, allocating a significant portion (57%) of their average total loan portfolio to cover operating expenses.[49]

MFIs have recognized that operational costs have a significant impact on their lending interest rates (Dorfleitner et al. 2013; Meyer 2019). Lowering lending interest rates necessitates increased efficiency and lower administrative costs (Lee et al. 2021). However, high-interest rates in MFIs around the world are often inherent in their operational structure, reflecting the inherent costs and risks associated with providing financial services that traditional banks may be hesitant to offer. The nature of MFI services, which cater to underserved populations and have a higher risk profile, contributes to the need for higher interest rates to sustain their

[48] Average Total Loan Portfolio = ([Total loans at the beginning of period + Total loans at the end of the period]/2)

[49] For example, on average, MFIs spend LAK 57 million in operating expenses for every LAK 100 million in their average total loan portfolio. Meaning that they have relatively high operational costs in relation to their loan portfolio size.

operations. This distinct operational environment, combined with the inherent risks assumed, may explain the characteristically high-interest rates observed in MFIs.

Nonetheless, it is critical to recognize that excessively high OE can exacerbate operating costs, potentially leading to an even higher interest rate burden on clients. The increased costs associated with maintaining an exceptionally efficient operation may inadvertently result in a counterproductive outcome, where the very efficiency sought ends up burdening clients with higher interest rates. This situation raises concerns about the business viability of Laotian MFIs and their ability to provide affordable financial services to the underserved population. Given the critical role that efficient resource utilization plays in providing affordable financial services to a larger segment of the population, the issue of OE becomes critical. Excessive operational costs may pose significant challenges to the goal of promoting financial inclusion.

The efficiency in OE enables MFIs to increase the number of clients served per credit officer. This indicates that MFIs can reduce costs and operate more efficiently in managing their credit clients (Garmaise and Natividad 2010). In addition, Beck and De La Torre (2007) argue that there is a potential correlation between cost-risk management and that some management activities can achieve both objectives simultaneously.

To address the challenge of exceeding OE, Laotian MFIs should identify and eliminate inefficiencies within the organization in order to reduce operational costs and increase efficiency. Furthermore, policies should be designed to incentivize MFIs to continuously improve their operational efficiency, with a focus on incentive measures rather than interventions during crises.

So far, BOL has taken specific steps to address Lao MFIs' failure to meet the central bank's standards. BOL issues warning announcements following off-site analyses based on regulatory financial ratios, as specified in the financial ratio regulation (No. 870/BOL, dated 14

November 2022). This requires assessing the overall financial health of MFIs in Laos using key indicators. For instance, when Lao MFIs fail to meet the prescribed standards during the off-site analysis, BOL issues official warnings, informing the MFIs of the identified issues. MFIs are required to provide detailed explanations of the issues at hand. If the problems are deemed serious and have the potential to jeopardize MFIs' stability, BOL initiates an urgent or emergency on-site investigation.[50]

If BOL discovers a serious problem after conducting on-site investigations, it implements early intervention measures in accordance with Article 50 of the Microfinance Decree (No. 184/GOV, dated 20 June 2022). This is applicable when failure to meet central bank standards is caused by factors such as insufficient operations with high systemic potential, inefficient internal management, a lack of transparency in the accounting system, or a consistent loss of profit for three years that potentially affects MFIs' short-term and long-term stability.

Under Article 50, BOL can implement early intervention measures by working with shareholders, the board of directors, internal audit committees, and managing directors to find solutions. MFIs must implement solution plans and report implementation results to BOL. If the identified issues persist, BOL may implement crisis management measures in accordance with Article 51 of the Microfinance Decree. BOL assumes direct control over the operational

[50] The period of implementation depends on the severity of each case. As outlined in Article 51 of the Microfinance Decree No. 184/GV dated 20 June 2022, the implementation process is guided by collaborative efforts between BOL and MFIs to find effective solutions. This collaborative approach includes several measures: 1) Cost Reduction: Working to reduce operational and management costs. 2) Financial Strengthening: Increasing reserve requirements and capital to enhance financial stability. 3) Debt Restructuring: Collaboratively developing plans to reconstruct debts with debtors based on MFIs' strategies. 4) Liquidity and Asset Management: Resolving liquidity and asset management issues based on funding sources. 5) Investment Limitations: Implementing measures to limit investments. 6) Asset Trading and Deposits: Reducing asset trading or deposits as deemed necessary. 7) Organizational Restructuring: Collaborating on the reconstruction of organizational structures. 8) Corporate Governance Measures: Implementing measures to limit the rights of major shareholders or dismissing managers who violate regulations. 9) Additional Measures: Undertaking any other necessary measures deemed essential by the BOL.

aspects of MFIs that are unable to address issues during the early intervention phase, particularly those related to corruption or a lack of transparency in business operations. This control is carried out without the consent or permission of debtors or shareholders, with the goal of ensuring the consistency of critical business operations, preventing financial system impacts, mitigating issue convergence, and preventing market panic or runs.

Under Article 57, the BOL directs the management teams of MFIs in developing and implementing recovery plans. This may include dismissing managers or staff who violate or do not follow recovery measures, reorganizing or replacing the board of directors or managing directors to ensure the success of recovery plans, discontinuing operations that are not aligned with recovery plans or other activities that affect stability, increasing capital registration, merging with other MFIs, or upgrading and modifying MFIs' enterprise models.

While BOL's measures are critical for ensuring MFI stability, their effective has been questioned. There is a need for policies that not only focus on early intervention and crisis management but also incentivize MFIs to improve their operational efficiency. Such policies could include providing tax breaks, subsidies, or reduced regulatory fees to MFIs that demonstrate effective operational management. This approach ensures the operational efficiency in the microfinance sector.

Furthermore, leveraging technology for automation is another key solution. Implementing advanced technological solutions can automate routine tasks, reducing the reliance on manual efforts. This may minimize the likelihood of errors and also help in substantial cost savings for MFIs. Technology can enhance the speed and accuracy of various operations that contribute to a more efficient operation. This can include computer-based scoring models for microcredit, which reduce the reliance on costly loan officers and branches.

Promoting the adoption of digital platforms[51] can help MFIs streamline processes, automate tasks, and standardize procedures. This digital transformation[52] not only reduces operational costs but also enhances control over credit default risk while making financial services more accessible to underserved populations.

However, it is critical to emphasize that proper oversight and governance of technological solutions are equally important. The ability to ensure the appropriate deployment and governance of fintech and other technologies is critical in preventing potential risks to users. If the central bank's governance mechanisms do not function properly, the use of fintech may put users in jeopardy. The role of the central bank in overseeing the implementation of fintech becomes especially important. Inadequate oversight may result in issues such as data security breaches, fraudulent activities, or other risks that could harm users and undermine the intended benefits of technological advancements in the microfinance sector.

3.2.5. Write-off (WO)

WO refers to a loan write-off that occurs when a loan is considered uncollectible (default) and

[51] The government of Laos has introduced its 9th Five-Year National Socio-Economic Development Plan (2021-2025). This plan places a strong emphasis on several key priorities, including improving the performance of financial institutions, introducing legislation for financial security, modernizing infrastructure to facilitate the transition to a digital economy, and empowering its citizens to take advantage of digital opportunities (Lao PDR 2021).

[52] Fintech combines finance and technology to offer innovative financial solutions and automate financial service delivery (Arner, Barberis, and Buckley 2015). It has the potential to lower costs, improve services, increase financial inclusion, and transform the financial industry (Moro-Visconti 2021). Fintech innovations include blockchain, digital advising and trading systems, peer-to-peer lending, equity crowdfunding, mobile payment systems, and AI/ML also solve business barriers (Philippon 2019). Fintech has enhanced the efficiency of banks and customer experience by streamlining operations and implementing digital technologies (Chen 2020). According to Dubey (2019), fintech innovations provide the most effective means to reduce costs, increase digitalization, and streamline transaction processing, leading to benefits for both banks and investors. Furthermore, the study by Moro-Visconti (2021) shows that fintech can help MFIs reduce transaction costs, expand outreach, and improve efficiency and transparency. Banna et al. (2022) suggests that fintech is transforming technology and proving effective in mitigating risks and expanding MFI impact in promoting financial inclusion.

must be removed from the records (to be written off). This process includes determining the write-off value by dividing the amount of loans that have been written off by the average total loan portfolios:[53]

$$\text{WO} = \frac{\text{Value of loans written off}}{\text{Average total loan portfolio}}$$

Prudent BOL regulations require that no MFI's WO exceed 2% and that the net impact on the balance sheet be reduced by deducting the written-off amount from both the loan portfolio and the loan loss reserve. Failure to do so results in an expense being recorded on the MFI's income statement. Given the short-term nature of MFI loans (typically less than a year), loans that are more than 180 days overdue or in default, as well as those that are undergoing legal recovery, should be written off.

BOL data reveals an average WO rate of 5.4% among MFIs in Laos, illustrating the challenges of credit risk management, especially when it exceeds regulatory standards. The average WO rate suggests a significant portion of the loan portfolio is being written off by MFIs when that proportion of loans has become unrecoverable, posing financial stability challenges.

The increase in WO may raise credit risk and is linked to a decline in the financial stability of MFIs (Hossain and Khan 2016). A major contributor to this increase in WO is the high competition between MFIs. Because of the intense competition, MFIs find it difficult to encourage regular payments from their customer base and keep their loyalty. Some MFIs may grant excessively large loans and loosen loan-granting criteria in an effort to retain customers. However, this approach can result in higher levels of client debt and a riskier loan portfolio,

[53] The Average total loan portfolios = ([Total loans at the beginning of period + Total loans at the end of the period]/2)

which in turn can lead to write-offs (Vogelgesang 2003; Chen et al. 2010; Sainz-Fernandez et al. 2015).

The competition situation among MFIs in Laos can be understood through several aspects. Firstly, the microfinance sector in Laos has witnessed remarkable growth, driven by an increasing demand for financial services, particularly among underserved and vulnerable populations who were traditionally excluded from the formal banking sector. This growth has resulted in a spread of MFIs operating in the country, with their numbers surging by 173% from 2014 to 2021. Simultaneously, there has been a staggering 637% increase in the volume of credit extended by these MFIs during the same period, indicative of intensified lending competition. In this crowded marketplace, maintaining customer loyalty becomes a considerable challenge as borrowers have an excess of options to choose from and may switch to other MFIs offering more favorable terms or lower interest rates.[54] To stay competitive, some MFIs may resort to granting excessively large loans and loosening their loan-granting criteria. While these similar tactics may temporarily retain clients, they can result in higher levels of client debt and a riskier loan portfolio. Borrowers inadequately assessed for creditworthiness may struggle to repay their loans, increasing the likelihood of defaults.

This competitive landscape of MFIs in Laos has led to market expansion, aggressive lending practices, and increased credit volumes. While competition raises greater financial inclusion, it also presents challenges in terms of maintaining client loyalty, managing risk, and avoiding high WO rates. Achieving a balance between growth and prudent risk management remains a critical challenge for the financial stability of MFIs operating in Laos. Efforts to

[54] According to Regulation No. 315/BOL, dated 20 May 2020, concerning the determination of interest rates of MFIs, the interest rates on loans offered by MFIs must not exceed four times the one-year interest rate for loans within the overall banking system.

minimize WO are crucial not only for financial stability but also for ensuring compliance with regulatory requirements, thereby facilitating the sustained provision of microcredit services to low-income individuals and businesses.

In addressing the issue of WO, the regulations and guidelines for responsible write-off practices should be established to minimize the likelihood of credit defaults. In addition, dealing with the WO issue may be achieved by strengthening risk assessment and management practices. MFIs should improve the evaluation and selection process for borrowers to minimize the number of risky loans. They can enhance customer loyalty and payment incentives through tailored financial literacy programs, empowering borrowers to make informed financial decisions and improving their repayment capabilities. Regulating loan-granting practices to prevent excessive indebtedness and collaborating with credit bureaus, if possible, to access accurate credit information are essential steps in reducing WO.

3.2.6. Portfolio at risk (PAR)

PAR is a financial metric used in the context of microfinance and lending institutions. It represents the percentage of the loan portfolio that is at risk of default. PAR is calculated by dividing the outstanding balance of loans that are past due over 30 days (but not necessarily in default) by the total loan portfolio:

$$\text{PAR} = \frac{\text{Portfolio at risk } (> 30 \text{ days})}{\text{Total loan portfolio}}$$

PAR shares the common objective of assessing risk with the Sharpe ratio, which provides insights into the financial domain.[55] In terms of risk assessment, PAR is focused on

[55] While both metrics contribute to risk assessment, PAR specializes in credit risk within lending portfolios, especially in microfinance, whereas the Sharpe ratio provides a broader evaluation of risk-adjusted performance in investment portfolios.

credit risk within microfinance or lending portfolios. It calculates the percentage of loans at risk of default by dividing the outstanding balance of past-due loans by the total loan portfolio balance. Similarly, the Sharpe ratio, applied in investment management, evaluates the risk-adjusted return of a portfolio. Its calculation incorporates the average return, risk-free rate, and standard deviation of the investment's returns, providing a view of risk in the context of investment performance (Lo 2002).

However, the main difference between PAR and Shape ratio[56] lies in their context of application and the nature of the risk addressed. PAR is mostly used in microfinance and banking sectors to manage credit risk in lending activities. It specifically focuses on the creditworthiness of borrowers and the potential for loan defaults within a portfolio.

According to BOL regulation, no MFI shall have a PAR greater than 5%. In essence, PAR provides information about the condition of a lending portfolio by indicating the proportion of loans that are experiencing payment problems. It is a performance indicator for MFIs to assess credit risk, monitor loan portfolio performance, and make informed decisions to mitigate potential losses. PAR is frequently used as an early warning indicator for MFIs to address loan delinquency and default issues.

The data reveals an important concern as the average PAR for MFIs in Laos is 13.5%. This figure suggests that a significant portion of the loan portfolio is facing difficulties, posing the risk of default or late payments. When the PAR exceeds regulatory criteria, it serves as an important signal, indicating areas that require immediate attention. Underlying issues could

[56] The Sharpe ratio is a key metric in investment management, guiding investors in assessing the trade-off between risk and return in their portfolios. It considers overall risk-adjusted performance by factoring in market volatility, returns, and the risk-free rate (Sharpe 1994).

include poor credit risk assessment, difficulties with borrower repayment capacity, or external economic factors affecting borrowers' ability to meet their financial obligations.

It should be noted that the problem of exceeding PAR of MFIs extends beyond Laos. A comparative analysis reveals that PAR values vary across regions. MFIs in the Indian Ocean region, for example, report a PAR of 11.6% (Lafourcade et al. 2005). A comprehensive study which included 278 MFIs from 60 countries discovered a 7.1% average PAR (Mersland and Øystein Strøm 2009). Further insights from various regions include an average PAR of 6.3% for MFIs in the Middle East and North Africa (Bassem 2012) and an average PAR of 9% in India (Rupa 2015).

Several factors can contribute to an increase in PAR in MFIs. Loan sizes that do not correspond to borrowers' repayment capacity can have a negative impact on PAR and increase risk in gross loan portfolios (Von Pischke 1991). In addition, the need for high-interest rates in Laotian MFIs arises from the nature of their services, which target underserved populations and have a higher risk profile, making such rates necessary for operational sustainability. However, according to Papias and Ganesan (2009) who study the effect of credit collection policy on PAR of MFIs in Tanzania, MFIs charging high-interest rates are prone to affect the safety of their loan portfolios, resulting in increased default rates and negative impact on MFIs' overall financial performance. Furthermore, McKernan (2002) shows that the common practice of many MFIs imposing high-interest rates on credit lines contributes significantly to loan defaults. As a result, an increase in borrowers' interest rates may lead to payment defaults and a higher PAR rate for MFIs.

MFIs should reconsider their loan sizing strategies to ensure they are in line with borrowers' ability to repay. Furthermore, interest rate policies must be carefully examined, as high rates may be contributing to the default problem. It is critical to strike a balance between

loan affordability for clients and the financial sustainability of lending operations (Ledgerwood et al. 2013). MFIs must effectively manage their loan portfolios to continue providing micro-loan services to their clients. The successful management of microfinance portfolios is critical to achieving long-term financial performance (Danstun and Harun 2019). Additionally, to bring PAR levels in line with regulatory standards, BOL should actively engage with MFIs, conducting thorough reviews and providing guidance on risk management practices.

Efforts have been made to enhance the efficiency and stability of MFIs in Laos. The government has issued a decree, No. 184/GOV, dated 20 June 2022, which emphasizes early intervention measures and crisis management. Additionally, regulatory oversight has been strengthened with the issuance of regulation No. 870/BOL on 14 November 2022. This regulation establishes financial ratios to ensure the stability of MFIs, aligning them with the standards set by the regulation based on the CAMEL rating system. This system serves as a tool for assessing the overall health of MFIs, identifying weaknesses, and determining necessary corrective actions. Moreover, the government has shown a commitment to improving the quality of loans provided by MFIs. Regulation No. 02/BOL, dated 04 February 2015, has been implemented to mitigate credit risk. It outlines rules and conditions related to loan and credit management and emphasizes efficient handling of non-performing loans (NPLs), PAR, debt restructuring, and WO.

However, the MFIs in Laos are still facing the challenge of a high rate of PAR that needs to be effectively addressed to ensure their long-term stability. To address this issue, the government's commitment to early intervention measures and crisis management, as outlined in decree No. 184/GOV, is a positive step. However, it must be reinforced and monitored regularly to ensure its effectiveness in safeguarding the financial stability of the microfinance sector. Furthermore, regulatory oversight, as indicated in regulation No. 870/BOL, should be

consistently enforced, with a focus on financial ratios aligned with the CAMEL rating system. This approach will help identify weaknesses in MFIs' operations and performance, allowing for timely corrective actions. Along with potential solutions, preventing the PAR problem is critical. Enhancing credit risk assessment processes, improving monitoring systems, and implementing effective collection strategies could help to prevent the impact of PAR and credit default risk.

3.3. Concluding remarks

MFIs play an important role in extending financial services to underserved communities in Laos, acting as a critical link between underserved individuals and the formal financial system. Their distinct advantages in management, regulatory compliance, and the provision of reliable financial services make them an ideal choice for promoting financial inclusion. However, as MFIs rapidly expand to meet rising demand, there is a risk that their performance will suffer, particularly in terms of credit defaults. This risk is enhanced by the nature of their customers, which normally consist of vulnerable groups who are excluded from formal financial services.

Government initiatives to enhance the efficiency and stability of MFIs are evident through a decree emphasizing early intervention measures and crisis risk management. Regulatory oversight has been strengthened to evaluate the overall health of MFIs, identify weaknesses, and prescribe corrective actions. The commitment to improving loan quality, as demonstrated by specific rules and conditions governing loan and credit management, underscores a proactive approach. Despite these initiatives, the effectiveness of these measures has been brought into doubt. MFIs in Laos continue to face performance issues. The current credit default threat exposes inefficiencies in loan management for low-income individuals who are still excluded from the formal financial sector.

The CAMEL rating ratio is used as a comprehensive metric in this chapter to examine the performance and credit default risk of MFIs in Laos. The findings from key performance indicators shed light on the complex challenges that MFIs in the country face, which are similar to those faced by MFIs in other developing countries. Low ROE and ROA raise profitability concerns, while OE suffers from operational inefficiencies and high costs, impeding the provision of affordable financial services. Excessively high WO and PAR highlight inefficiencies in managing loans for low-income individuals, emphasizing the critical need for strategic interventions.

This chapter lays the groundwork for informed discussions and strategic interventions. Maintaining a commitment to early intervention measures, consistent regulatory enforcement, and proactive solutions is critical for ensuring the long-term stability of MFIs in Laos. In order to mitigate the impact of Portfolio risk and credit default risk, sustained efforts to improve credit risk assessment, monitoring systems, and collection strategies will be required. The implications of these findings provide practitioners and policymakers with insights, allowing them to make informed decisions for the improvement of MFIs and the advancement of financial inclusion efforts in Laos.

The effectiveness of fintech solutions in improving operational efficiency, broadening financial services access, and enhancing risk management within MFIs presents a transformative opportunity to address existing limitations. This highlights the importance of taking a closer look at how fintech solutions affect MFIs. The upcoming chapter of this dissertation will delve into the potential benefits and risks associated with fintech solutions. By exploring how fintech can improve the efficiency, stability, and social impact of MFIs in Laos, the next chapter will lay a robust foundation for fostering financial practices that are more inclusive and sustainable in the country.

Chapter 4. Benefit and risks of fintech solutions for improving the efficiency, stability, and social impact of MFI

4.1. Background and literature reviews

Fintech, short for financial technology, combines finance and technology to provide new and convenient financial solutions that leverage technological advancements (Arner, Barberis, and Buckley 2015). This umbrella term encompasses a variety of technology-driven businesses that automate financial services and is rapidly growing due to supportive government policies, advancements in information technology, and the sharing economy. These innovations have disrupted traditional industry structures, blurred business boundaries, allowed for strategic disintermediation, and transformed how businesses produce and deliver their products and services (Philippon 2019). Fintech and internet-only banking have also improved overall efficiency and customer experience in the banking sector by implementing digital technologies and streamlining operations (Chen 2020). These fintech innovations offer the best solution for reducing costs, increasing digitalization, and streamlining transaction processing, benefiting both banks and investors (Dubey 2019).

Every business is seeing the effects of digital disruption, including the banking sector, which has a reputation for conservatism. Financial institutions of all sizes, from major banks to small micro-lenders, operate in a highly competitive and sometimes unstable market today. New business models and marketplaces are being created as a result of fintech's rise, which is shaking up the financial sector (Vives 2017). Moreover, digital-based financial inclusion is becoming increasingly important for development interventions. This involves a complex network of state institutions, international development organizations, philanthropic investment, and fintech companies. Together, they create digital ecosystems that use data to expand and monetize financial inclusion efforts. This is achieved through a combination of behavioral economics and

predictive algorithms that help accelerate access to finance and monitor customer engagement. The digital revolution has added new layers to the material cultures of financial inclusion and offers new ways for the state to expand the inclusion of the legible while allowing global finance to profile poor households as potential sources of financial assets (Gabor and Brooks 2017).

Financial institutions have been able to enhance their customer relationship management (CRM) effectiveness by incorporating fintech technologies, all while adhering to regulations and responding to societal expectations (Kotarba 2016). Fintech offers the strategic capability for firms to occupy a market niche in the financial sector, it enables the generation of alternative credit scores based on non-traditional data and improves the financial inclusion of previously excluded market segments (Leong et al. 2017). The study by Banna et al. (2022) examined the impact of fintech-based financial inclusion on the risk-taking behavior of 512 MFIs in 29 Sub-Saharan African countries. The findings suggest that fintech solutions play a crucial role in reducing the risk-taking behavior of MFIs. The study performed several robustness tests to validate these findings and highlight the importance of the overall accessibility of fintech solutions in reducing the risk-taking of MFIs. The study also concludes that fintech solutions are particularly relevant for small-scale MFIs. Policymakers and MFI managers can use these results to support fintech solutions as part of financial inclusion strategies and operational stability.

Gomber et al. (2018) discuss how the financial services industry is facing significant technological innovations and disruptions. As a result, the industry and new fintech start-ups are looking for ways to create successful business models, improve customer experience, and transform services. The article proposes a new fintech innovation mapping approach that evaluates changes and transformations occurring in four key areas of the financial services industry. These include operations management, technology innovations, lending and deposit

services, and investment and financial markets. The article suggests that the financial services industry needs to improve its efficiency, customer focus, and knowledge to stay competitive with the fintech revolution. According to the study on the effects of fintech products on the performance of commercial banks in China, Chen et al. (2021) discovered that these fintech products have a positive influence on the quality of services and work efficiency of banks. Moreover, Brammertz and Mendelowitz (2018) claim that the use of the blockchain's smart contract feature for financial transactions can significantly lower transaction costs. Hannoon et al. (2021) conducted an intriguing study to explore the potential of fintech in enhancing the performance of Bahraini banks. Their method involved creating a comprehensive checklist, which they distributed to the banks for completion. The authors then compared the completed checklists to the financial performance reports of the same banks, obtained from the Bloomberg database for 2019. Excitingly, the results showed a significant correlation between the use of fintech and improved financial performance, as assessed by the ROE ratio.

The emergence of fintech has created a paradigm shift in the financial industry, transforming the traditional financial ecosystem and opening up opportunities for financial institutions to enhance the efficiency of their performance. Fintech offers innovative solutions that can address the limitations faced by traditional MFIs, allowing them to expand their reach and improve the delivery of financial services to remote and marginalized areas (Mention 2019; Tok and Heng 2022). By leveraging technology-driven innovations such as mobile banking, digital lending platforms, and alternative credit scoring methods, fintech can unlock new possibilities for financial inclusion (Yeyouomo et al. 2023). With the adoption of fintech, traditional MFIs can streamline their operations, reduce costs, and enhance their risk management capabilities (Brammertz and Mendelowitz 2018; Dubey 2019; Chen 2020; Chen et al. 2021; Hannoon et al. 2021). This, in turn, can result in increased access to financial

services for underserved populations, as well as the development of tailored financial products to meet their unique needs. However, alongside the potential benefits, fintech solutions also come with inherent risks and challenges that need to be carefully managed (Arner, Barberis, and Buckley 2015). Examples of relevant risks include the failure to accurately assess creditworthiness, exposure to market fluctuations, non-compliance with regulations, challenges in fraud detection, and susceptibility to cyber-attacks (Giudici 2018).

With the rapid growth of fintech, it is important to explore the benefits and risks of fintech solutions. This chapter is dedicated to providing insights into how fintech could potentially improve the efficiency, stability, and social impact of MFIs in Laos, thus laying the groundwork for more inclusive and sustainable financial practices in the country. Additionally, it stresses the importance of addressing the risks and challenges associated with fintech solutions to fully leverage its potential for MFIs to improve their efficiency, stability, and social impact for financial inclusion.

The remaining sections are structured as follows: The next section highlights the advantages of fintech solutions, focusing on enhancing the performance, stability, and societal impact of MFIs. In Section 4.3, we delve into the risks of fintech solutions. Lastly, Section 4.4 concludes the chapter.

4.2. The benefit of fintech solutions

In Laos, MFIs have outperformed village banks in terms of regulatory compliance and providing reliable financial services. MFIs' simplicity in services compared to commercial banks has made them a key player in promoting financial inclusion, resulting in significant growth (see Chapter 2). However, this rapid expansion has brought about performance

challenges, including operational inefficiency,[57] high operational costs, exceeding stability standards in the portfolio at risk, and increased write-offs, all contributing to heightened credit default risks (see Chapter 3). Therefore, it is imperative to enhance MFI efficiency, mitigate credit default risks, ensure stability, safeguard depositors' financial security, and sustain long-term financial inclusion support.

In the digital era, fintech solutions play a crucial role in enhancing financial inclusion by positively impacting the operational management of MFIs. Integrating fintech tools into their processes empowers MFIs to more effectively manage risks and costs, as well as conduct comprehensive customer data analysis (Bumacov, Ashta, and Singh 2014; Wyman 2017; Banna et al. 2022).

Advanced risk management tools and credit scoring algorithms provided by fintech solutions assist MFIs in accurately evaluating borrowers' creditworthiness, thereby reducing the risk of defaults (Benami and Carter 2021). A practical example of this is MyBucks, a fintech company primarily operating in mobile banking across African countries. Through digital transactions, MyBucks minimizes cash transactions and gathers data for future analysis. This data-driven approach enables MFIs to gain insights into customer profiles based on location and type, ultimately decreasing risk. Facial recognition technology is also being explored by MFIs to identify individuals with multiple loans or accounts, a task difficult for humans but manageable for AI. This fintech solution utilizes AI for various purposes such as credit scoring, fraud prevention, chatbot services, loan prediction, and direct lending via platforms like Facebook and WhatsApp (Ashta and Herrmann 2021).

[57] In general, MFIs often encounter operational efficiency challenges when expanding their services to remote areas (Labie et al. 2011; Mersland and Strøm 2013).

Moreover, fintech solutions especially credit scoring, enable MFIs to make data-driven decisions. For instance, "according to Bumacov, Ashta, and Singh (2014), MFIs that use credit scoring tend to have more efficient loan officers, resulting in increased loan provision and borrower outreach. They emphasize how credit scoring aligns with the microfinance mission, especially in developing economies where financial inclusion is vital for various developmental goals. Despite recognizing the significance of loan officers in financing micro-borrowers, it is crucial to acknowledge that these officers often operate in informal settings marked by substantial information imbalances between the MFI and potential borrowers. Inefficient methods of bridging this information gap led to significant opportunity costs for borrowers, lenders, and society as a whole. In contrast, judiciously using credit scoring has the potential to reduce these opportunity costs, promote greater financial inclusion, and enable MFIs to achieve sustainable growth. Credit scoring acts as the accelerator pedal that enables a balanced approach to growth and credit risk exposure, becoming a critical tool for expanding financial inclusion and facilitating developmental opportunities (p. 411-412)".

Fintech solutions also enhance the customer experience for MFI clients through convenient and user-friendly interfaces. Mobile banking applications, for instance, enable clients to access accounts, conduct transactions, and receive updates more easily. This is particularly important since the primary challenge in lending to the underserved is the high transaction costs in relation to the small loan sizes. However, mobile banking effectively reduces these costs by eliminating the need for borrowers to physically visit a bank and by mitigating the risk of theft during transportation (Bumacov, Ashta, and Singh 2014).

The microfinance sector has recognized that operational costs significantly influence the lending rates of MFIs (Dorfleitner et al. 2013; Meyer 2019). To address this challenge, integrating fintech into MFI operations offers a solution by automating and digitizing processes,

thereby boosting efficiency, reducing administrative costs, and lowering lending rates (Ivatury 2009; Badruddin 2017; Lee et al. 2021). By using information and communication technologies in innovative ways to efficiently handle numerous small transactions and provide various financial services at a lower cost, formal financial institutions can become more appealing to serving economically disadvantaged individuals (Ivatury 2009). Regarding the impact of fintech development, the results indicate that fintech innovations not only enhance the cost efficiency of financial institutions but also improve the technology used by them (Lee et al. 2021). Fintech enables MFIs to enhance operational efficiency, reduce costs, and provide regular alerts to clients without extra charges, thus better serving their existing customer base. Additional benefits include reducing branch congestion and allowing field officers to spend more time in the field, such as loan monitoring and client education, rather than collecting cash (Badruddin 2017).

Incorporating fintech solutions into the MFI framework holds significant potential for addressing cost-related concerns, ultimately leading to lower interest rates and broader societal impact through improved financial inclusion (Dorfleitner, Davide, and Quynh 2022).

Numerous studies have revealed that well-managed and cost-effective MFIs exhibit a more significant social impact (Ayayi and Sene 2010; Amersdorffer et al. 2015; Iqbal et al. 2019). Fintech solutions leverage digital tools and automation to optimize processes, subsequently cutting operational expenses and time in serving clients (Pytkowska and Korynski 2017). With heightened efficiency and decreased operational costs, MFIs can potentially offer lower interest rates and fees, rendering financial services more accessible and affordable to economically vulnerable individuals (Banna et al. 2022).

Fintech solutions provide a practical avenue for MFIs to connect with unbanked or underbanked populations in remote areas, facilitating access to crucial financial services. This

encompasses digital payments, mobile banking, and microloans through user-friendly mobile applications (Badruddin 2017). By embracing technology, MFIs can rapidly expand their reach at a reduced expense, serving a larger clientele and effectively extending services to remote regions (Banna et al. 2022). Fintech has also introduced microfinance solutions, enhancing financial inclusion for those with limited access to conventional banking services (Bayram, Talay, and Feridun 2022).

4.3. The risk of fintech solutions

While fintech solutions come with numerous benefits, they also carry risks that MFIs need to thoughtfully consider. As MFIs adopt new technologies, they need to be vigilant about potential fintech-related risks, including cyber threats, operational disruptions, and outdated regulations. While technology can improve operations, relying excessively on fintech without proper risk management and human oversight can heighten vulnerabilities and cyber risks (Giudici 2018).

Fraud's core principles remain consistent, but wrongdoers now use innovative tactics, particularly exploiting information technology, to target fintech (Deloitte LLP 2015). Cybercrimes not only lead to financial losses for financial institutions but also jeopardize their reputation (Lewis and Baker 2013). The economic impact of cybersecurity risk in fintech is underscored by a recent report estimating global annual losses exceeding USD 1 trillion due to cyberattacks (McAfee 2020). Both MFIs and their clients are exposed to cybersecurity vulnerabilities and potential data breaches due to the collection and storage of sensitive financial and personal information. While fintech brings efficiency and expanded services, robust data security protocols are essential to counter potential breaches (Badruddin 2017).

In the fintech domain, critical information might be stored on mobile devices, which are susceptible to loss or theft (Lee and Shin 2018). Additionally, some fintech solutions prioritize

anonymity, complicating the understanding of digital identities. This obscurity can aid wrongdoers in masking hacking origins or illicit activities (Avergun and Kukowski 2016). Fintech often relies on error-prone data sources, potentially escalating risks for consumers. Given the centrality of trust in adopting new technologies, fintech should prioritize security to protect themselves and their customers from cyber threats (Jagtiani and Lemieux 2017).

Acknowledging trust's importance in embracing new technologies, fintech firms should prioritize security and privacy maintenance. Regulatory bodies, consumer protection groups, and fintech entities are expected to collaborate to ensure secure and value-enhancing fintech experiences (Lee and Shin 2018). The partnership between financial institutions and fintech companies aims to enhance service quality, agility, innovative thinking, and digital infrastructure. However, this collaboration exposes traditional financial institutions to cybersecurity risks like malware attacks, data breaches, and data integrity concerns within fintech firms (Najaf, Mostafiz, and Najaf 2021).

In the banking industry, while most traditional banks recognize fintech partnerships' profitability potential, 71% of banks express concerns about fintech-related cybersecurity vulnerabilities (Digital News Asia 2018). The study by Najaf, Mostafiz, and Najaf (2021) asserts that profitable and enduring partnerships between financial institutions and fintech require collaborative efforts to mitigate inherent cybersecurity risks. Therefore, fintech enterprises must implement effective measures to protect sensitive consumer data from unauthorized access (Lee and Shin 2018).

In the realm of fintech, similar to any information technology tool, maintaining security and data privacy is a consistent concern, especially given the financial transactions involved (Ebrahim, Rabab, Sumathi Kumaraswamy 2020). Building trust with clients is crucial when introducing novel financial technologies. Comprehensive consumer protection measures,

addressing fraud, and disputes, and transparent disclosure of terms and conditions, are essential. Clear communication of benefits and robust consumer protection policies can alleviate concerns and nurture trust (Badruddin 2017).

Moreover, these technological advancements can give rise to challenges, particularly in maintaining transparency and traceability. In a world driven by complete automation, with the widespread use of AI applications and data, addressing issues related to biases and the limited "explainability" or unclear workings of algorithms becomes a concern (Murinde, Rizopoulos, and Zachariadis 2022). As numerous fintech solutions, such as blockchain, crowdfunding, and cryptocurrencies, are relatively new in the financial sector, central banks worldwide are working to establish fitting regulations. However, a potential risk arises when regulations are delayed or lacking (Ebrahim, Rabab, Sumathi Kumaraswamy 2020).

For instance, consider a fintech company involved in peer-to-peer lending. Typically, lending regulations are based on a financial institution's capital structure. Yet, these rules might not be directly applicable to such firms, as their activities differ from traditional lending practices (Lee and Shin 2018). Regulators face a daunting task, as fintech challenges exceed the current capacity of financial authorities, and the rapid pace of technological innovations complicates timely responses (Ehrentraud et al. 2020). In Laos, the current legislation for fintech may be insufficient or unclear, causing MFIs to be hesitant to adopt new technologies. For example, the current branch expansion approval process is well-defined, but it lacks clarity for significant changes or innovations.[58] This may reduce the motivation of MFIs to adopt fintech. Furthermore, the existing Consumer Protection Law, enacted on June 30, 2010, establishes broad guidelines for protecting consumers who use products and services but lacks specific

[58] The decree on microfinance No. 184/GOV, dated 20 June 2022.

guidelines for handling and safeguarding client financial data. Although the government recently issued a decree on Consumer Protection for Financial Services on April 6, 2020, it does not cover fintech services. The lack of regulatory support and clear guidelines for handling and securing fintech services raises serious concerns about associated risks, such as scams, improper platform use, and fintech sector failures.

A similar issue is observed in India, where MFIs confront substantial challenges in digitization due to a lack of robust regulatory backing and clear guidelines for managing and securing client data. This situation breeds significant concerns about associated risks like fraud, platform misuse, and transaction failures (Badruddin 2017). The present regulatory challenge is to strike a balance between maximizing the benefits offered by fintech innovations and safeguarding the financial system and customers from potential underlying risks tied to these innovations (Appaya and Gradstein 2020).

Consequently, the potential benefits of fintech solutions for MFIs in Laos are substantial, promising enhanced performance, stability, and a broader social impact. The integration of technology allows MFIs to overcome traditional barriers and extend financial services to underserved communities. However, careful assessment of risks and tackling potential challenges is important to ensure the responsible and sustainable integration of fintech solutions in the microfinance sector.

The need for comprehensive risk management is a critical aspect of this integration. Staying ahead of potential threats and the complex nature of fintech requires continuous monitoring of emerging risks and the adaptation of risk management strategies (Ng and Benny 2017). MFIs should prioritize operational disruption mitigation to protect against potential financial losses, reputational damage, and adverse effects on clients. While fintech adoption of MFIs may obtain services from fintech developers, it is critical to consider the extent to which

MFIs are involved in developing their protection mechanisms. MFIs can actively engage in developing solutions in addition to cybersecurity measures, stringent data protection protocols aligned with regulatory standards such as the law on electronic data protection No. 25/NA, dated 12 May 2017 and well-defined emergency plans. This involvement could include the establishment of MFIs' internal cybersecurity teams and the encouragement of collaborations with technology experts. Strategies that go beyond these protective mechanisms are also important. This could include MFIs' staff training programs to increase basic cybersecurity awareness and well coordination between MFIs and their fintech developers to improve risk assessments to identify emerging threats and improve operational resilience.

Furthermore, regulatory frameworks play a critical role in shaping responsible fintech adoption in MFIs. Previous research has concluded that regulatory frameworks must be updated and clarified to provide clear guidelines for the integration of fintech solutions while ensuring compliance and reducing uncertainties (Anagnostopoulos 2018). There is a need for a collaborative platform that allows for experimentation and knowledge exchange about new solutions that comply with regulatory frameworks, to implement effective cybersecurity measures, ensure secure data exchange, and reduce the risk of cyber threats (Ng and Benny 2017; Alaassar. et al. 2020). Collaborative efforts between regulatory bodies, consumer protection groups, and fintech entities are critical to mitigate the risk associated with fintech.

Additionally, it is important to prioritize transparency and explainability in fintech solutions, particularly those that use automation and AI. This emphasis may also assist supervisory authorities in translating existing regulations relating to transparency and information provision into clear expectations for regulated entities in the context of AI (Kuiper et al. 2022). Clear communication about how algorithms work helps to build trust and addresses concerns about biases and the unclear operation of these technologies (Truby 2020). This

commitment to transparency can help MFIs adopt fintech responsibly and ethically, aligning technology with social values. MFIs can implement the potential of fintech solutions while minimizing the associated risks by understanding these potential solutions. This balanced and collaborative approach ensures that the benefits of fintech are implemented responsibly, thereby contributing to MFIs' long-term stability and positive social impact in Laos

4.4. The balance of relationship and transaction banking

Adoption of fintech solutions offers undeniable benefits in areas where financial inclusion is critical for underserved communities in Laos. However, MFIs engage in both relationship and transaction banking by extending financial services to the poor while evolving micro-loans into profitable businesses (Armendáriz de Aghion and Morduch 2005). There is a need for cautious fintech implementation to avoid an overemphasis on profit or solely focusing on transactional efficiency.

The difference between relationship and transaction banking is reflected in how they approach lending. Relationship banks seek both (soft) qualitative information, gained through ongoing client interactions, and (hard) financial data (Berger, Udell, and Klapper 2001). This method involves a decentralized decision-making structure, giving loan officers access to subtle details about the firm, owner, and community. On the other hand, transaction-based lending relies on easily measurable (hard) information, often derived from financial statements or salary statements, using credit scoring systems. Transaction lenders mainly focus on consumer loans for specific purchases, although borrowers may also redirect these loans toward business investments (Berger and Udell 2002).

While the theoretical distinction between relationship and transaction banking is clear, it is becoming less different as banking evolves. Nowadays, banks do both relationship and

transaction banking. The extent to which a bank engages in each is a strategic decision influenced by factors such as technology, competition, regulation, and others. Banks must evaluate their distinct competitive advantages when making this decision (Boot and Thakor 2000). In the competition in the microfinance sector, both socially motivated MFIs use relationship banking methods and private for-profit MFIs that offer transaction-based. For-profit institutions use credit scoring systems to address issues such as information imbalance and high enforcement costs, allowing them to save on specified costs such as loan officers' salaries (Rhyne 2001). Eventually, customers can choose to get loans through a transaction bank, a relationship bank, or a combination of transaction and relationship loans (Bolton et al. 2016).

In Laos, the MFI landscape reflects a range of practices, including a dual strategy of relationship and transaction banking, as well as a stronger emphasis on relationship banking. Approximately 94% of MFIs in Laos operate in dual approaches that include both relationship and transaction banking. This strategic style demonstrates their understanding of the importance of managing transactions efficiently while also developing strong customer relationships. In practice, these MFIs offer basic transactional services such as savings accounts and small-scale loans. Simultaneously, they prioritize the delivery of personalized financial solutions and actively participate in community trust-building efforts. Notably, MFIs support community groups and contribute to the facilitation of activities in the communities they serve. In contrast, a few MFIs that take the role of NSOs place a strong emphasis on relationship banking as their primary operational strategy. NSOs go beyond basic transactions to act as facilitators or coordinators. These include financial advisory services, VF portfolio management, and community development initiatives (Prochaska, Philipp, and Fischer 2012; Dennis and Thorsten 2017). This variety of practices within the Lao MFI characteristic not only reflects the diversity

of strategies used by institutions to address local challenges and opportunities (where poor individuals and communities have limited access to banks), but it also reflects the broader contributions made to the Lao finance sector. The main goal of these various MFI approaches remains a sustained commitment to the economic well-being of clients and the communities they serve, embodied by a collective commitment as an important part of financial inclusion and community development.

Regardless of the specific approach, MFIs' integration of fintech solutions in Laos requires careful consideration. While technology improves transactional efficiency and access to financial services, it should not overshadow the mission of promoting meaningful relationships and addressing broader community needs. Achieving the right balance is particularly important in the microfinance sector, where a suitable approach extends beyond financial transactions to include the multifaceted needs of underserved communities. Accordingly, MFIs must be careful not to lose sight of their primary goal. Regardless of the benefits of fintech, its implementation in both relationship and transaction banking should be guided by a commitment to financial inclusion, right practices, and positive social impact. Fintech should be used to enhance the efficiency and stability of MFIs without jeopardizing the helpful approach that characterizes relationship banking in microfinance.

4.5. Concluding remarks

The rapid advancement of fintech has brought revolutionary changes to global financial services, offering innovative solutions with the potential for significant economic growth and financial inclusion. Fintech solutions have already proven their ability to improve operational efficiency, broaden access to financial services, and enhance risk management within MFIs. This presents a transformative opportunity for MFIs in Laos to overcome their existing

challenge of providing affordable financial services to low-income and underserved populations.

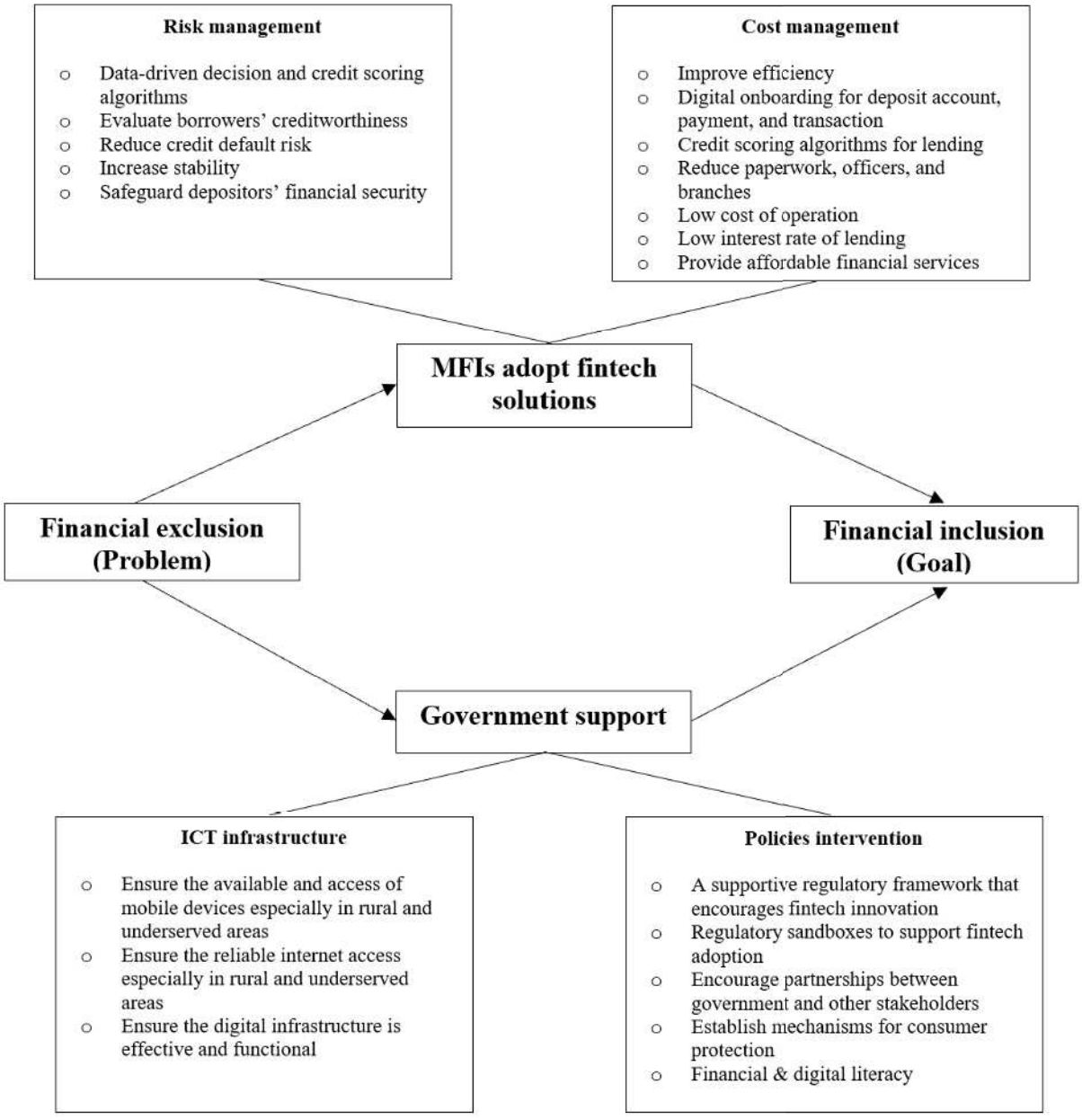
Figure 13 summarizes the benefits of fintech solutions for improving the efficiency, stability, and social impact of MFIs in the context of financial inclusion. One key aspect of fintech adoption is cost management. MFIs can significantly enhance their efficiency by digitizing various processes. For instance, digital onboarding allows customers to open deposit accounts online, eliminating the need for physical visits to MFI branches. This not only reduces administrative overhead but also expedites the account-opening process, enhancing convenience for customers. Moreover, fintech-driven credit scoring algorithms enable MFIs to assess the creditworthiness of borrowers with greater accuracy. This not only decreases the reliance on manual underwriting but also improves risk assessment, ultimately resulting in a lower cost of lending.

The adoption of fintech solutions also translates to a reduction in paperwork, the number of loan officers, and physical branches. Digitizing loan applications, customer documentation, and record-keeping not only streamlines operations but also lowers costs associated with paperwork. With mobile banking apps and online platforms, MFIs can reach customers remotely, reducing the requirement for a large workforce of loan officers and physical branches. These cost savings can be passed on to customers in the form of lower interest rates of lending, making financial services more affordable and accessible.

In addition to cost management, fintech solutions enhance risk management for MFIs. Data-driven decision-making, powered by fintech, allows MFIs to access extensive customer data and make informed lending decisions. Advanced credit scoring algorithms assess borrower creditworthiness more accurately, reducing the risk of lending to individuals with a high

likelihood of default. This not only safeguards the depositors' financial security but also increases MFIs' stability, contributing to long-term support of financial inclusion.

Figure 13. MFIs, fintech, and government support in promoting financial inclusion



Nonetheless, alongside the numerous advantages, fintech solutions also introduce certain risks that MFIs must carefully consider. As MFIs adopt novel technologies, they must

remain watchful about potential fintech-associated risks, encompassing cyber threats, operational disruptions, and outdated regulatory frameworks. While fintech holds the promise of bolstering MFIs' performance and narrowing financial disparities, it is important to effectively address these risks. Embracing technology to advance financial access requires a responsible approach to integration. Aside from that, the balance of relationship and transaction banking is critical. This balance ensures that MFIs manage transactions efficiently while developing strong customer relationships. It emerges as a critical component for long-term financial inclusion, emphasizing the importance of being cautious when integrating fintech solutions into microfinance.

Furthermore, despite these advantages of fintech solutions, it is worth noting that only 83% of the population in Laos owns a mobile device and 48% has internet access (Demirgüç-Kunt et al. 2022). This creates a problem in reaching those who do not have cell phones or internet access. Government support is critical in addressing this challenge. For instance, "von Hippel and Jin (2008) argue that the government plays a fundamental role in stimulating user innovation. It involves efforts to minimize transaction costs for user-innovators by facilitating connections among innovative individuals and providing access to problems aligned with their interests. To achieve this, governments could explore options like offering affordable or free internet access to those lacking it. This parallels historical government decisions to support the establishment and upkeep of public roads (p.10)". Furthermore, the extent of government support significantly influences individuals' willingness to engage in online banking. Well-defined cyber laws, for instance, instill confidence in users, as noted by Chong et al. (2010). Additionally, government support shapes the adoption of fintech through investments in infrastructure development. This includes enhancements in internet connectivity, digital payment systems, and cybersecurity measures (Hu et al. 2019).

Consequently, to ensure financial inclusion for the populations in Laos who lack cell phones, mobile devices, or internet access, governments can play a vital role by addressing the foundational aspect of ICT infrastructure (Figure 13). This includes ensuring that mobile devices are widely available and affordable, particularly in rural and underserved areas where traditional banking services may be scarce. Simultaneously, they must invest in expanding and improving internet connectivity, as reliable internet access is paramount for accessing fintech services. In remote regions, these improvements can make the difference between financial exclusion and inclusion.

After ensuring that cell phones and reliable internet access are available to those who are currently excluded, a supportive regulatory framework is required to encourage the use of fintech. This framework plays a crucial role in enabling fintech adoption while also ensuring consumer protection and maintaining financial stability. Regulatory sandboxes, for instance, offer a controlled environment where fintech innovations can be tested in certain areas with reduced regulatory constraints. Such initiatives encourage experimentation and pave the way for new financial products and services. Moreover, governments can encourage partnerships between public and private sectors (banks, fintech firms, and MFIs) as well as NGOs. Collaboration among these stakeholders is pivotal in creating a thriving fintech ecosystem. By bringing together expertise, resources, and innovative solutions, these partnerships can drive fintech adoption and expand financial inclusion efforts.

Ensuring consumer protection is a critical element of government support in fintech adoption. It is essential to upgrade the central bank's measure under the Consumer Protection for Financial Services Decree, which currently does not cover fintech services to include such services. This not only increases trust in fintech services but also protects users' financial well-being. Moreover, government have a role to play in improving financial and digital literacy

among their citizens. Educational initiatives and awareness campaigns can help individuals, particularly those in underserved areas, use fintech services effectively and securely. Enhancing the current central bank program that encourages FSPs to actively promote financial literacy among their customers by incorporating financial education into their services. Together with this, reaffirm the government's goal of integrating financial literacy education into the formal education system. By promoting financial and digital literacy, government can equip people with the knowledge and skills they need to make informed financial decisions and take advantage of fintech solutions.

The findings of this chapter serve as a starting point, but it is crucial to tailor and apply these insights to the unique situation of MFIs in Laos. Local factors such as government support, regulations, and technological capabilities greatly influence the potential impact and the adoption of fintech solutions. Therefore, the next chapter will examine the main factors driving and hindering fintech adoption in MFIs in Laos.

Chapter 5. Developing the Technology Acceptance Model (TAM) to examine fintech adoption in MFI in Laos[59]

5.1. Background and literature reviews

The financial sector has witnessed the positive impact of fintech, as highlighted in extensive research that fintech enhances operational efficiency (Brammertz and Mendelowitz 2018; Dubey 2019; Chen 2020; Chen et al. 2021; Hannoon et al. 2021), bank lending (Sedunov 2017; Sanchez 2018; Sheng 2021), financial stability (Fung et al. 2020; Daud et al. 2022), and financial inclusion (Mention 2019; Tok and Heng 2022; Yeyouomo et al. 2023). While fintech innovations have transformed the industry globally, their potential impact on MFIs in developing countries is particularly significant.

Considering the important role of MFIs and the vast development of fintech, the adoption of fintech in MFIs presents an opportunity to improve their efficiency, stability, and make a more substantial impact on financial inclusion (Moro-Visconti 2021; Banna et al. 2022). Notably, none of the MFIs in Laos currently leverage fintech. According to Huong et al. (2021), Laos consistently ranked at the bottom among ASEAN nations for fintech adoption from 2017 to 2019. Despite progress in digital connectivity, as indicated by increased internet usage and fixed-telephone subscriptions (International Telecommunication Union 2017), Laos still trails behind neighboring countries like Thailand, Vietnam, and Cambodia in the overall ICT Development Index ranking.

In the past few years, there have been a growing number of research studies focused on developing a conceptual model for fintech adoption. These studies have explored various variables, such as attitudes, intention to use, government support, user innovation, brand image,

[59] This chapter is based on an article that accepted to be published in Volume 22 of the Journal of East Asian Studies.

trust, and risk, to gain a better understanding of the factors influencing fintech adoption in the financial industry (Ryu 2018; Hu et al. 2019; Kim Lien et al. 2020; Nangin et al. 2020; Xie et al. 2021). The study by Homaid (2019) focuses on the supply side by investigating the factors influencing the acceptance and utilization of Information and Communication Technology (ICT) in Yemeni MFIs. TAM was used as the study's foundational framework, and it was expanded by incorporating self-efficacy and training elements. The goal of this adaptation was to develop a TAM model that was specifically tailored to the unique context of the microfinance industry. Based on 276 survey responses from MFI employees, the study used Partial Least Square Structural Equation Modeling (PLS 3.2.8) to test both measurement and structural models, revealing that perceived usefulness, perceived ease of use, and self-efficacy significantly influenced employees' intention to adopt and use ICT. Besides that, the study discovered that training was a significant predictor, influencing perceived usefulness, perceived ease of use, self-efficacy, and behavioral intention. This study sheds light on critical factors influencing ICT adoption in the unique context of microfinance. Furthermore, the study conducted by Khatun and Tamanna (2021) explores the factors that influence fintech adoption within Bangladeshi financial institutions. The sample consisted of ten banks, five non-bank financial institutions (NBFIs), and five brokerage firms from the country's financial sector. Using the Unified Theory of Acceptance and Use of Technology (UTAUT) model and surveying 265 employees from banks, NBFIs, and brokerage firms, the study discovered that factors such as effort expectancy, social influence, facilitating conditions, perceived reliability, and added value positively influenced users' behavioral intention. The findings suggest that effective Fintech adoption improves decision-makers' ability to implement innovative strategies in Bangladesh's financial sector.

The research by Jiwasiddi et al. (2019) focuses on the demand-side and examines the Millennial attitudes towards using fintech for money transfers and payments. The study investigates the influence of brand and service trust, perceived usefulness, and perceived ease of use on attitudes towards adopting fintech. The study was conducted at a university in Jakarta and found that all three factors had a significant impact on attitudes towards using Fintech. Belanche et al. (2019) proposed a research framework to understand the adoption of robo-advisors by potential customers, with a focus on the influence of personal and sociodemographic variables. Data from a web survey of 765 potential users in North America, the UK, and Portugal confirm the validity of the measurement scales and provide input for structural equation modeling and multisample analyses. The study finds that consumers' attitudes toward robo-advisors and mass media and interpersonal subjective norms are the key determinants of adoption. Perceived usefulness and attitude have a stronger influence on users with higher familiarity with robots, while subjective norms are more important for users with lower familiarity and customers from Anglo-Saxon countries.

Chuang et al. (2016) examined the factors that influence consumers' intention to use fintech services by integrating brand and service trust into the technology acceptance model (TAM). A total of 440 valid responses were collected using convenience sampling. The findings indicated that brand and service trust had a positive influence on attitudes toward using fintech services. Additionally, perceived usefulness and perceived ease of use also had a positive effect on attitudes toward using, which in turn positively influenced consumers' behavioral intention to use Fintech services. Jin et al. (2019) identified the factors that influence consumer awareness and acceptance of fintech products and services in Malaysia. It develops a conceptual framework that includes independent variables such as usefulness, ease of use, relative advantage, perceived risk, perceived cost, and the mediating effect of consumer awareness on

the dependent variable of consumer acceptance. The study's findings could assist fintech companies in promoting their products and services effectively in Malaysia.

A number of studies also focus on the adoption of fintech for financial inclusion, Setiawan et al. (2021) explore the role of fintech in increasing financial inclusion for the unbanked population in Indonesia. The study used online questionnaires to collect data from 485 fintech users between December 2020 and April 2021. The study found that user attitude towards fintech is the most important factor in predicting fintech adoption in Indonesia. Additionally, user innovativeness was found to, directly and indirectly, affect fintech adoption, while financial literacy was found to be the least important variable in predicting fintech adoption. The results suggest that fintech has the potential to reach unbanked populations and those with low financial literacy. To make fintech more inclusive, the government should focus on improving ICT infrastructure, encouraging fintech startups, and driving financial institutions to participate in fintech. Moreover, the article by Senyo and Osabutey (2020) discusses the potential for fintech innovations to increase financial inclusion by providing access to financial services through mobile devices. However, despite their potential, the widespread adoption and use of these technologies remain limited. The article argues that understanding the factors that influence users' behavior towards financial technologies is crucial for increasing financial inclusion. The study focuses on mobile money as an example of fintech innovation and uses the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) and the Prospect theory to explore the antecedents to the actual use of fintech innovations. The study finds that performance and effort expectancy are significant factors influencing the intention to use mobile money services, while other factors such as price value, hedonic motivation, social influence, and perceived risk do not have a significant influence. The study concludes with theoretical contributions and practical implications for increasing financial inclusion.

The study by Singh et al. (2020) proposes a research framework to examine the adoption and use of fintech services from a technology acceptance perspective. The framework includes sub-constructs from the TAM, the unified theory of acceptance and use of technology (UTAUT), ServPerf, and WebQual 4.0. The study classifies these sub-constructs into three dimensions: adoption, behavior, and technology, and explores the relationships between them. The data for the study is collected from 439 active Internet users through a digital survey, and the analysis is done using structural equation modeling and multi-group analysis. The study finds that perceived usefulness and social influence are the key determinants of behavioral intention to use FinTech services, with social influence having a significant negative impact. Actual use is significantly influenced by ease of use and social influence but is not determined by behavioral intention and perceived usefulness. Technological attributes and digital behavior significantly impact behavioral attributes, and age significantly affects the perception of security among older users.

Huei et al. (2018) identified factors that affect consumers' intention to adopt fintech products and services in Malaysia by extending TAM. The proposed factors were usefulness, ease of use, competitive advantage, perceived risk, and perceived cost. The authors also suggested that the attitude towards using FinTech products could mediate the relationship between these factors and the intention to adopt FinTech. The study conducted by Ryu (2018) proposes a benefit-risk framework to understand why some users are willing to adopt fintech, while others are hesitant. The study considers both positive and negative factors affecting users' adoption decisions. Empirical data was collected from 244 fintech users and investigated whether perceived benefits and risks significantly impact fintech adoption intention. The results show that legal risk has the biggest negative effect on adoption intention, while convenience has the strongest positive effect. Furthermore, early adopters and late adopters have different

driving factors. Fernando and Touriano (2018) explored the impact of trust and risk on the adoption of fintech in Indonesian society, drawing on prior scholarship that has underscored the salience of these factors in the utilization of fintech. Building on TAM, the researchers undertook pilot studies involving 133 communities to establish and refine the models and instruments. To ensure the reliability and validity of the research instruments, a quantitative research methodology was employed, with smart pls v3.0 utilized for analysis. The resulting analysis identified 31 robust and valid research instruments that hold promise for future research inquiries.

Previous research has focused on examining fintech adoption in relation to the acceptance of technology. The majority of existing literature on technology acceptance relies on TAM, which has been extensively tested and established (Luarn and Lin 2005; Venkatesh and Bala 2008; Chuang et al. 2016; Lee 2017; Marakarkandy, Yajnik, and Dasgupta 2017; Huei et al. 2018; Fernando and Touriano 2018; Meyliana and Fernando 2019). TAM was developed in 1986 to provide a basis for understanding the external factors that affect internal beliefs, attitudes, and intentions (Davis 1986; Davis et al.1989). The model proposes that the perception of ease of use and usefulness of technology predicts attitudes, subsequent acceptance, and usage of technology (Venkatesh and Bala 2008). TAM was adapted from the Theory of Reasoned Action (TRA) to model users' acceptance of information systems (Hale et al. 2002). TAM has been developed and tested to examine the effect of system features on users' acceptance of computer-based information systems. This model aims to improve understanding of user acceptance processes and provide user acceptance testing to enable service providers to evaluate proposals and meet user needs. TAM is widely used in studies that examine behavioral intention to adopt new technology (Davis et al. 1989; Davis 1989).

Other technology acceptance models, such as the Unified Theory of Technology Acceptance and Use of Technology (UTAUT), have also been used in previous studies (Slade et al. 2015; Singh et al. 2020: Xie et al. 2021). Some studies have employed the Theory of Planned Behavior (TPB) (Lee 2009; Ozkan and Kanat 2011), TAM2 as a revision of TAM (Venkatesh 2000), and UTAUT2 (Alalwan et al. 2017; Senyo and Osabutey 2020) as a revision of UTAUT, which are all adaptations of TRA and share several features with TAM. In many studies, additional variables, such as perceived security, risk, and social influence, have been introduced to increase the predictive power of TAM variables (Cheng et al. 2006; Dumpit and Fernandez 2017; Huei et al. 2018; Daud et al. 2018; Singh et al. 2021; Al-Okaily et al. 2021).

Undoubtedly, TAM has emerged as a widely employed theoretical framework for examining user acceptance and technology adoption. However, while TAM has been useful in many contexts, it has limitations in accounting for external factors that may impact adoption. Therefore, the incorporation of additional variables such as government support, perceived risk, and regulation can provide a more nuanced understanding of fintech adoption. By examining government support variables, researchers can better understand the extent of government support and how it affects fintech adoption (von Hippel and Jin 2008; Chong et al. 2010; Hu et al. 2019; Goo and Heo 2020). Incorporating perceived risk variables into TAM can help researchers understand the impact of risk perceptions on fintech adoption (Grewal et al. 1994; Dowling and Staelin 1994; Kim et al. 2008; Xie et al. 2021, Ali et al. 2021). In addition, the regulatory variables can provide insights into the impact of regulations on fintech adoption.

Furthermore, TAM was used to investigate the adoption of new technology from both the supply and demand sides. The primary difference between demand-side and supply-side studies is the participants or samples involved. While demand-side studies focus on individuals or clients as their sample, supply-side studies look at organizations as represented by the people

who work for them. When studying fintech adoption using TAM and other models, the term "user" is used for both the demand and supply sides. On the supply side, "user" refers to financial institutions or employees who use fintech to improve performance and efficiency in providing financial products and services. On the demand side, "users" are customers who adopt or use fintech services.

Previously, most research on fintech adoption has focused on the demand side, with little attention given to the supply side. This asymmetry may be due to the challenges associated with data collection from institutions. Obtaining data from organizations is more difficult when compared to individuals, which may result in participation restrictions and issues related to small sample sizes, affecting the robustness of statistical analyses in the studies. However, this gap in research focus raises concerns about a comprehensive understanding of fintech adoption. While demand-side studies are important in helping us understand factors influencing customer intentions in fintech adoption, they may overlook factors affecting financial institutions in their adoption efforts and hinder the provision of fintech services. Moreover, previous demand-side studies may have lacked insights into the factors influencing financial institutions that have yet to adopt fintech as well as those that have already adopted and provided fintech services.

Considering these limitations, understanding fintech adoption from the supply-side perspective becomes critical. This knowledge is important for understanding factors influencing the intentions of financial institutions to adopt fintech and recognizing the barriers that prevent them from doing so. In the context of this dissertation, we specifically focus on the adoption of fintech within MFIs, emphasizing the supply side. Given the significant growth of MFIs and their important role in advancing financial inclusion in Laos, along with the country's ongoing efforts to embrace fintech, there is a necessity to investigate fintech adoption within MFIs in this country.

This dissertation examines fintech adoption in MFIs by developing a theoretical model based on the TAM, incorporating perceived risk, government support, and regulation. To validate the model, we conducted an empirical test to assess its reliability and validity in predicting MFIs' intention to adopt fintech. For data collection, we designed a questionnaire and determined the sample size using the finite population correction formula (Daniel 1999) among the 120 MFIs in Laos. This calculation resulted in a sample size of 84. To ensure the representativeness of our sample, we employed a random sampling method. Using a computer-generated random number generator, 84 participants were selected from the initial 120 MFIs. However, due to incomplete answers, 10 participants had to be excluded, resulting in a final sample size of 74 for our analysis. We employed Structured Equation Modeling (SEM) to analyze the collected data and evaluate the proposed hypotheses. The results of our analysis provide substantial evidence in support of the extended TAM model, demonstrating its effectiveness in predicting the factors that affect the intention of MFIs to adopt fintech.

This chapter contributes to the existing literature in several ways. First, it fills the gap that virtually little study has examined fintech adoption in MFIs by extending TAM. It enhances the theoretical understanding of fintech adoption in MFIs by developing TAM, incorporating perceived risk, government support, and regulation. Second, this chapter focuses on the adoption experiences of future or non-users, providing insights into the factors influencing their intention to adopt fintech and the barriers they face. This approach expands the understanding of fintech adoption beyond the experiences of existing users. Lastly, the empirical findings presented practical insights for practitioners to overcome barriers and promote fintech adoption in the microfinance sector.

The following section develops and proposes hypotheses. Section 5.3. introduces the research model and describes the research methods and data collection. Section 5.4. shows a

comprehensive analysis of the research model and results. The study's findings are discussed in Section 5.5. Finally, Section 5.6. concludes with the study's implications.

5.2. Developing hypotheses

5.2.1. Perceived usefulness

In this study, we define perceived usefulness (PU) as the belief of MFIs that using fintech will result in beneficial outcomes. MFIs are more likely to adopt fintech if they think using fintech will improve their operations and efficiency. Hence, the more MFIs believe in fintech's usefulness; the more likely it is that they will adopt and use fintech. Previously, PU has been employed in several studies that have used TAM to define the extent to which users think that adopting a particular system or technology will improve their performance and aid in more effective job implementation (Davis 1989; Davis et al. 1989). Numerous studies have discovered that PU significantly influences users' intentions to adopt fintech (INT). For example, the study by Chuang et al. (2016) confirmed that users are more willing to use fintech if they positively perceive its benefits. In addition, the study by Jiwasiddi et al. (2019) argued that besides the innovation of fintech, users choose to utilize fintech because they see personal benefit in using such technology. Moreover, the findings of the study by Al-Okaily et al. (2021) concluded that it should not be surprising that people will increase their adoption of fintech if they see the usefulness of such systems. Based on the previous empirical evidence, we propose the following hypothesis:

H1. Perceived usefulness (PU) positively influences the intention of MFIs to adopt fintech (INT).

5.2.2. Perceived ease of use

Perceived ease of use (PEU) is defined in this study as the degree to which MFIs are ready to

begin adopting fintech and the degree to which MFIs currently have the necessary technological facilities to support their fintech adoption. The term "PEU" was initially defined in the literature on technology adoption as the extent to which people expect to be able to embrace new technologies with little to no difficulty (Davis et al. 1989). PEU has been shown to affect INT in several empirical studies. For example, the study conducted by Tun-Pin, et al. (2019) suggested that a user's opinion of how easy a system is to use significantly affects whether or not the user intends to use fintech for banking transactions. Moreover, Singh et al. (2020) came to a similar conclusion that users were more likely to adopt fintech when they thought it was easier to use. In addition, PEU also influences the intellectual process of PU (Venkatesh and Bala 2008). The study by Venkatesh (2000) found that PEU will influence PU toward adopting new technology because the easier it is to use, the more helpful technology can be. Numerous empirical studies found that PEU affects PU. For example, the study by Luarn and Lin (2005) confirmed that people are more likely to see the benefits of technology if they perceive it to be easy to use. Furthermore, the study by Gu et al. (2009) showed that PEU is the most significant variable in PU. It suggested that mobile banks should focus on making their services easy to use to promote the adoption of mobile banking. Alalwan et al. (2017) also suggested that if people perceived using technology as simple and easy to use, they would be more likely to see its benefits and find it useful. In the present study, because of the unique characteristics of fintech, a certain level of MFIs readiness and the necessary technological facilities to support fintech adoption may increase the likelihood that MFIs will see the usefulness of fintech. Accordingly, PEU may significantly influence the PU of such technologies among MFIs. We, therefore, propose the following hypothesis:

H2. Perceived ease of use (PEU) positively affects the intention of MFIs to adopt fintech (INT).

H3. Perceived ease of use (PEU) positively affects the perceived usefulness (PU) of adopting fintech.

5.2.3. Government support

This study defines government support as a necessary element for MFIs to adopt fintech. Government support plays a crucial role in stimulating user innovation and driving fintech adoption (von Hippel and Jin 2008). Previous research has found that the level of government support is a determining factor in individuals' willingness to use online banking, as clear cyber laws instill confidence in users (Chong et al. 2010). Furthermore, government support plays a significant role in shaping the regulatory environment (Rapih et al. 2023). When governments provide favorable regulations and policies, it can enhance the perception of a supportive regulatory framework. The implementation of sandbox pilot protocols with government support can also boost investments in fintech by reducing uncertainty (Goo and Heo 2020). Moreover, government support influences fintech adoption through investments in infrastructure development, including improved internet connectivity, digital payment systems, and cybersecurity measures (Hu et al. 2019). These initiatives contribute to enhancing the overall ease of use of fintech services. When potential users have access to reliable and efficient infrastructure, it reduces barriers and enhances the user experience, making fintech adoption more convenient and beneficial. Considering these factors, the following hypotheses are proposed:

H4. Government support (GS) positively affects the intention of MFIs to adopt fintech (INT).

H5. Government support (GS) positively affects the perception of MFIs on regulation (REG).

H6. Government support (GS) positively affects the perceived ease of use (PEU) of adopting fintech.

H7. Government support (GS) positively affects the perceived usefulness (PU) of adopting fintech.

5.2.4. Perceived risk

This study defines perceived risk as three main types: financial risk, security risk, and performance risk. In the context of people's decisions to adopt new technology, financial risk has been extensively studied as a crucial aspect of perceived risk (Grewal et al. 1994). Security risk refers to the potential loss of privacy and control over personal data when criminals exploit customers' identities for unauthorized fraud, while financial risk pertains to the potential monetary loss due to fraudulent activities (Featherman and Pavlou 2003). On the other hand, performance risk relates to the possibility that the product or service may not function as expected (Grewal et al. 1994). However, there is a lack of consensus among scholars regarding the precise definition of "perceived risk." In essence, perceived risk represents how individuals perceive the potential uncertainties and negative consequences associated with adopting a new product or service. These perceptions of risk can significantly impact individuals' willingness and intention to adopt new technology (Dowling and Staelin 1994). Notably, perceived risk has a negative effect on users' intention to adopt Internet banking at the initial stage, specifically in terms of financial, security, and performance risk (Lee 2009). Moreover, when consumers perceive potential risks in online transactions, they become worried about the unknown and undesirable outcomes (Kim et al. 2008). This worry can influence how users perceive the convenience of adopting fintech. In the context of new technology, if users perceive risks, it can have a negative impact on their behavior (Ali et al. 2021). The reason for this negative impact is that users may be less inclined to adopt fintech platforms due to the complexity of the adoption process and the feeling of being isolated in terms of time and space (Xie et al. 2021). The perception of uncertainty and complexity surrounding fintech can influence how easy it is perceived to use. When individuals anticipate negative outcomes like financial loss or privacy

breaches related to fintech adoption. Such perceived risks can impede the perceived ease of use, as users may find the technology more challenging or risky to navigate. Given these factors, we suggest the following hypotheses:

H8. Perceived risk (PR) negatively affects the intention of MFIs to adopt fintech (INT).

H9. Perceived risk (PR) negatively affects the perceived ease of use (PEU) of adopting fintech.

5.2.5. Regulation

In this study, "regulation" refers to how MFIs perceive regulations that could potentially hinder their adoption of fintech. The multiplicity of business models within the financial sector has presented practitioners and policymakers with significant challenges. Among these challenges are ensuring that consumers and investors are well protected and that threats to financial stability and the economy as a whole are accurately assessed (Claessens et al. 2018). Moreover, regulators also confront the difficulty of ensuring a fair playing field for incumbent financial institutions and new entrants to encourage expansion in fintech while protecting the financial system. It is important that new entrants in fintech do not play the same role that shadow banking did before the 2007-2009 financial crisis by concealing systemic risk (Vives 2017). Since the recent financial crisis, international standard-setters and national authorities have tightened and restructured financial regulations. As a result, financial institutions must adhere to more tightening regulations (Hannig and Jansen 2010).

The Bank of the Lao PDR (BOL), which is the country's central bank, is accountable for maintaining a secure microfinance and banking system in Laos. BOL oversees the operations of MFIs primarily under regulations such as the decree on microfinance No.460/GOV, dated 03 October 2012, and the guideline of implementation on microfinance decree No.01/BOL, dated 19 April 2016. MFIs must always obtain BOL approval before making significant changes and

innovations such as increasing authorized capital, accepting an external loan, partnering with foreign investors and firms, changing shareholders, expanding branches and units, adopting accounting and operation software programs, and providing new types of financial products and services. Moreover, BOL does off-site analysis and on-site inspection. It requires the MFIs to adhere to the stability measures standard outlined in the regulation on non-deposit microfinance supervision No. 02/BOL, dated 20 June 2008, the regulation on deposit microfinance supervision No. 04/BOL, dated 20 June 2008, and the rules on classification of debt and deduction of classified debt of microfinance institutions No. 02/BOL, dated 04 February 2015. Additionally, to further ensure that MFIs strictly adhere to regulations, on 20 September 2018, BOL enacted a regulation on actions against violators No.845/BOL.

Tightening regulations, on the other hand, raises the risk that financial institutions may shift risky financial activities outside of the regulated financial system. Therefore, stricter regulations might have unforeseen effects (Philippon 2016). For example, strict regulations on traditional banks increased the market share of riskier shadow banks[60] in US mortgages from roughly 30% in 2007 to 50% in 2015, with the majority of the growth taking place in 2011 (Buchak et al. 2018). Moreover, tightening regulations also negatively affects the fintech lending market when regulations are made more restrictive for financial institutions.[61] This

[60] Shadow banks contributed to the recent financial crisis by making loans to sell to third parties virtually entirely. The third party's identification is context-specific and, hence, product-specific: To put it simply, Fannie Mae and Freddie Mac purchase conforming mortgages, whereas Ginnie Mae purchases government-backed mortgages from the Federal Housing Administration and the Veterans Administration. Private securitization firms purchased nonconforming jumbo and subprime mortgages. These nonagency markets, in which shadow banks had been most active and engaged before the crisis, disappeared during it. Shadow bank lenders like Countrywide and New Century could not get new funding when the secondary market for nonconforming subprime and jumbo loans collapsed in 2007. Thus, many shadow bank lenders went bankrupt or were acquired by more conventional financial institutions (Buchak et al. 2018).

[61] The study's findings show that stricter regulations appear to inhibit consumer credit activity, similar to what happens with aggregate and company fintech credit (Claessens et al. 2018).

could suggest that areas where banking regulation is laxer also have low controls on fintech activities. On the other hand, countries with stringent prudential and bank licensing systems may make it harder to initiate new lending operations. Less stringent regulation of fintech activities might facilitate their growth but encourage regulatory arbitrage if similar risks are regulated more strictly in traditional financial institutions. Accordingly, it may be difficult for financial institutions in countries with stringent regulations and financial license regimes to adopt fintech (Claessens et al. 2018). After considering these factors, we put forward the following hypothesis:

H10. Regulation (REG) negatively affects the intention of MFIs to adopt fintech (INT).

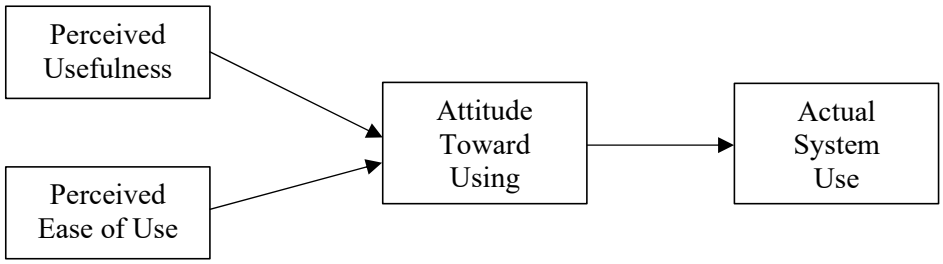
5.3. Methodology

5.3.1. Research model

The research model of this study is based on the original TAM (see Figure 14). TAM introduced by Davis (1986), is the research framework that aims to understand how external factors influence internal beliefs, attitudes, and intentions. According to TAM, the perception of ease of use and usefulness of technology predicts attitudes and subsequent usage of technology (Davis et al. 1989). Initially adapted from the theory of reasoned action (TRA), TAM has been extensively tested and established as a dominant model in technology acceptance literature (Hale et al. 2002; Luarn and Lin 2005; Venkatesh and Bala 2008; Chuang et al. 2016; Lee 2017; Marakarkandy, Yajnik, and Dasgupta 2017; Meyliana and Fernando 2019). To enhance its predictive power, additional variables such as perceived security, risk, and social influence have been introduced by previous studies (Cheng et al. 2006; Dumpit and Fernandez 2017; Huei et

al. 2018; Singh, Sahni, and Kovid 2021; Al-Okaily et al. 2021).

Figure 14. Technology Acceptance Model (TAM)



However, virtually little study has examined fintech adoption in MFIs by expanding TAM. To address this gap, we developed a research model based on the original TAM, incorporating additional constructs such as government support, perceived risk, and regulation[62] (see Figure 15). We aimed to understand the factors that affect the attitude of Lao MFIs towards adopting fintech,[63] specifically referring to their intentions[64] to adopt fintech into their operations.

In the research model of Figure 15, H1 to H10 represent the hypotheses. Perceived usefulness (PU), perceived ease of use (PEU), government support (GS), perceived risk (PR), regulations (REG), and intention (INT) are latent variables. Each latent variable has its observed variables (see Table 11). There are five measured variable indicators of PU (PU1, PU2, PU3, PU4, and PU5) and three of PR (PR1, PR2, and PR3). There are four indicators of GS (GS1,

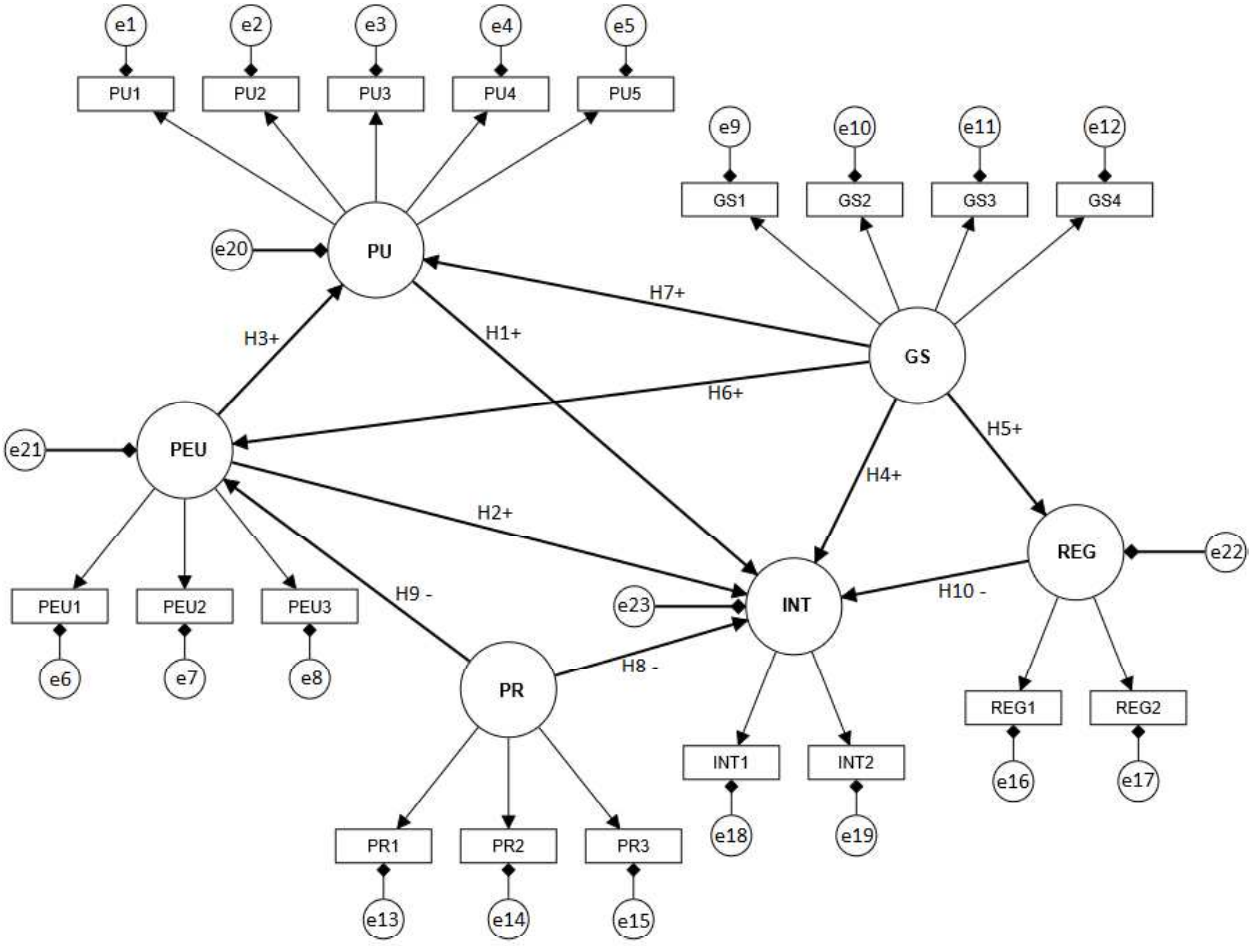
[62] Including regulatory variables can shed light on the influence of regulations on fintech adoption in MFIs. Adding perceived risk variables to TAM helps us understand the impact of risk perceptions on fintech adoption (Grewal et al. 1994; Dowling and Staelin 1994; Kim et al. 2008; Xie et al. 2021, Ali et al. 2021). Furthermore, by examining government support variables, we can better understand the extent of government support and its effect on fintech adoption (von Hippel and Jin 2008; Chong et al. 2010; Hu et al. 2019; Goo and Heo 2020).

[63] Attitude refers to how an individual feels about using a specific system in their job. It reflects their evaluative affect towards the system. In this context, the definition and measurement of attitude align closely with the definition of behavioral intention (Davis 1986).

[64] Venkatesh and Bala (2008) refer to attitude as the behavioral intention that is predicted by perceived ease of use and perceived usefulness.

GS2, GS3, and GS4), two of the REG (REG1 and REG2), two of INT (INT1 and INT2), and three of PEU (PEU1, PEU2 and PEU3). In the path diagram of this model, circles represent latent variables, and rectangles represent measured variables (also known as observed variables or indicators). Arrows between latent variables and their indicators show the influence or association the unobservable constructs have on the observed variables. Additionally, arrows among the latent variables show the relationships between factors that affect fintech adoption in MFIs.

Figure 15. Research model



Note: Refer to Table 11 for the meanings of the acronyms associated with the observed variables displayed in the rectangles (GS1, GS2, GS3, GS4, INT1, INT2, PEU1, PEU2, PEU3, PR1, PR2, PR3, PU1, PU2, PU3, PU4, PU5, REG1, REG2).

5.3.2. Data collection

To test the research model and examine the study hypothesis, we partnered with the Bank of the Lao PDR and the Lao Microfinance Association (LMFA) to collect relevant empirical data by conducting an online survey. The study participants were the managing directors who represented MFIs to join this study. To determine our sample size, we started by identifying all 120 MFIs in Laos. We aimed for a 95% confidence level with a 5% margin of error, and we estimated the population proportion to be 77%.[65] Since the proportion is larger than 5% (n/N > 0.05), we applied the formula with finite population correction (Daniel 1999):

$$n' = \frac{NZ^2P(1-P)}{d^2\,(N-1) + Z^2P(1-P)}$$

where n' is the sample size with finite population correction; N is population size; Z is Z statistic for a chosen level of confidence (for a 95% confidence level, Z is commonly set to 1.96); P is expected proportion (expressed as a fraction of one; if 77%, P = 0.77); and d *is* precision or margin of error (expressed as a fraction of one; if 5%, d = 0.05). Applying these values in the formula:

$$n' = \frac{(120)(1.96)^2(0.77)(0.23)}{(0.05)^2(120-1) + (1.96)^2(0.77)(0.23)}$$

Upon the calculation, the sample size (n') is 84. To ensure our sample's representativeness, we employed a random sampling method. Using a computer-generated random number generator, we randomly selected 84 participants from the initial MFI population. This randomization process guaranteed that our final sample closely represented the entire population. Subsequently, we distributed an online questionnaire via email and other

[65] The expected proportion is calculated by comparing the number of MFIs that are members of the LMFA (93) to the total number of MFIs in Laos (120).

messaging applications to the managing directors of these 84 MFIs. However, we had to eliminate 10 respondents from the study due to incomplete and inappropriate answers (such as declining to fill out the consent form), resulting in a final sample size of 74 for this study.

To ensure the scale's content validity, we mostly adapted items from previous literature for each construct as shown in Table 8. The survey used the measure variables, and each variable has an indicator using a five-point Likert scale to measure it. There are seven sections in the questionnaire: (1) General information of the respondents (2) MFIs' opinion on the perceived usefulness of using fintech (3) MFIs' opinion on the perceived ease of use of using fintech (4) MFIs' opinion on the perceived risk of using fintech (5) MFIs' opinion on the government support of using fintech (6) MFIs' opinion on the existing regulation related to the microfinance sector, and (7) MFIs' opinion on their intention to use fintech (see Appendix A).

Table 8. Statistics on measurement items of latent variables

Latent Variables	Measurement Items	Mean	Std. Deviation	Sources
Government Support (GS)	GS1: Government support will help my MFI in fintech usage	4.270	0.643	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017; Tan and Teo 2000)
	GS2: The government has introduced new legislation and revised some existing regulations to reduce barriers to fintech initiatives and support fintech services	4.230	0.669	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017)
	GS3: The government should have a sandbox pilot protocol that allows operators to experiment and use fintech	4.176	0.644	Adapted from (Goo and Heo 2020)
	GS4: The government set up all kinds of infrastructure, namely telecom networks and information communication technology (ICT), that promote and support the use of fintech	4.338	0.552	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017; Tan and Teo 2000)
Intention (INT)	INT1: My MFI intends to use fintech	3.068	1.245	Adapted from (Cheng et al. 2006; Marakarkandy,

				Yajnik, and Dasgupta 2017)
	INT2: My MFI is likely to use fintech as soon as possible	2.824	1.277	Adapted from (Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017; Pavlou 2003)
Perceived Ease of Use (PEU)	PEU1: Using fintech is easy without hard effort	3.432	0.823	Adapted from (Hu et al. 2019)
	PEU2: It is easy for my MFI to have the equipment that supports the use of fintech (Servers, Computers, Electronic devices, Internet, Software, etc.)	3.595	0.752	Adapted from (Hu et al. 2019)
	PEU3: My MFI is ready to start using and providing fintech services to customers	3.581	0.735	Adapted from (Cheng et al. 2006; Hu et al. 2019; Marakarkandy, Yajnik, and Dasgupta 2017)
Perceived Risk (PR)	PR1: Using fintech will cause financial risk to my MFI	3.068	0.859	Adapted from (Kim et al. 2008; Ryu 2018)
	PR2: Using fintech will cause a security risk that my MFI will damage by cyber attacks	3.324	0.737	Adapted from (Lockett and Littler 1997; Ryu 2018)
	PR3: Using fintech will cause performance risk to my MFI	3.068	0.684	Adapted from (Lockett and Littler 1997; Ryu 2018)
Perceived Usefulness (PU)	PU1: Using fintech will benefit my MFI	3.878	0.734	Adapted from (Cheng et al. 2006)
	PU2: Using fintech will save the operational cost of my MFI	3.743	0.718	Adapted from (Hall and Khan 2003; Lockett and Littler 1997)
	PU3: Using fintech will improve the quality of my MFI's products and services	3.892	0.708	Adapted from (Lockett and Littler 1997; Singh et al. 2020)
	PU4: Using fintech will make my MFI sustainable	3.743	0.754	New indicator
	PU5: Using fintech can support financial inclusion	3.932	0.622	New indicator
Regulation (REG)	REG1: The microfinance-related regulations have created difficulties, prevented, and slowed my MFI intention to use fintech	4.014	0.688	New indicator

	REG2: The law on consumer protection is being used ineffectively and inefficiently	3.649	0.761	New indicator

Table 9 displays the sample demographics, showing that 73% of respondents were from non-deposit microfinance institutions (NDTMFIs).[66] The largest group consisted of MFIs that had been in operation for one to five years. Moreover, 89% of those who responded do not have a branch, and 73% do not have a unit. Most participants reported authorized capital in the range of one to five billion LAK (1 USD is about 19,101 LAK).

Table 9. Description of respondents

Demographics	Items	Frequency	Percentage
Type of MFIs	DTMFI	20	27%
	NDTMFI	54	73%
Year of Establish	≤ 1 year	1	1.4%
	1-5 years	31	41.9%
	6-10 years	29	39.2%
	11-20 years	12	16.2%
	≥20 year	1	1.4%
Branche	Have	8	11%
	Do not have	66	89%
Unit	Have	20	27%
	Do not have	54	73%
Authorized Capital	≥ 1 billion LAK	11	15%
	1-2.9 billion LAK	20	27%
	3-5.9 billion LAK	29	39%
	6-10 billion LAK	4	5%
	≤ 10 billion LAK	10	14%

[66] According to Article 2 of the non-deposit microfinance supervision No. 02/BOL, dated 20 June 2008, NDTMFI is a financial institution that has been granted a license to do business by the Bank of the Lao PDR (BOL), but it is not allowed to accept deposits from the general public. In addition, NDTMFI is defined under the decree on microfinance No. 460/GOV, dated 03 October 2012, as a financial institution that provides microloans and other financial services. Meanwhile, a deposit-taking microfinance institution (DTMFI) is a financial institution that can take a deposit, provides microloans, and other financial services.

5.4. Data analysis and results

5.4.1. Original research model testing

5.4.1.1. Reliability testing

In this study, we utilized SmartPLS software[67] as a tool to assess the fit of the research model. Initially, we employed confirmatory factor analysis (CFA)[68] to examine the reliability, which aimed to determine the consistency of the measurement outcomes across repeated procedures (Carmines and Zeller 1979; Heale and Twycross 2015). The assessment of the measurement model involved estimating internal consistency for reliability. To calculate internal consistency, we utilized both Cronbach's alpha (Hammersley 1987; Hasan et al. 2021; Heale and Twycross 2015) and composite reliability (CR) (Ruvio et al. 2008; Setiawan et al. 2021). Internal consistency reliability is deemed acceptable when both Cronbach's alpha (representing the lower limit) and CR (representing the upper limit of the unknown true) exceed 0.7 (Hair et al. 2013). As shown in Table 10, each latent variable has Cronbach's Alpha and CR excess of 0.7, which means the model that includes reliability was estimated with a high acceptant level.

[67] SmartPLS is a software tool that represents a significant advancement in latent variable modeling by integrating cutting-edge techniques such as PLS-POS (Partial Least Squares-Path Modeling with Optimal Scaling), IPMA (Interaction- and Polynomial-Based Model Analysis), and sophisticated bootstrapping procedures (Ringle, C. M et al. 2022). This study used SmartPLS version 4.0.9.4 to evaluate model fit using various fit indices, assess the significance of relationships between latent variables, and generate graphical representations of the results.

[68] This study used CFA as part of the Structural Equation Modeling (SEM) framework to rigorously evaluate the underlying factor structure of the survey instrument. CFA is chosen because it provides a more rigorous assessment of the underlying factor structure of the survey instrument compared to Exploratory Factor Analysis (EFA) (Bollen 1989; Jöreskog and Sörbom 1989). By testing and confirming a pre-specified measurement model based on prior theory and research, CFA allows for hypothesis testing and model evaluation (Anderson and Gerbing 1988; Bagozzi, Yi, and Phillips 1991; Avolio, Bass, and Jung 1999). Unlike EFA, which explores new factor structures, CFA focuses on confirming an existing structure (O'Leary-Kelly and Vokurka 1998). Previous studies have successfully employed CFA to assess the fit between observed data and theoretical models by estimating relationships between observed variables and latent variables (Schreiber et al. 2006). Therefore, this study aims to test the proposed measurement model and evaluate how well the observed data aligns with the theoretical model by utilizing CFA.

Table 10. Reliability and validity measures (original research model)

Constructs	Items	Factor loadings	Cronbach's alpha	CR	AVE
GS	GS1	0.573	0.724	0.739	0.412
	GS2	0.710			
	GS3	0.700			
	GS4	0.556			
INT	INT1	0.955	0.928	0.933	0.875
	INT2	0.918			
PEU	PEU1	0.400	0.714	0.721	0.503
	PEU2	0.811			
	PEU3	0.835			
PR	PR1	0.762	0.805	0.803	0.577
	PR2	0.828			
	PR3	0.687			
PU	PU1	0.928	0.879	0.884	0.622
	PU2	0.596			
	PU3	0.835			
	PU4	0.629			
	PU5	0.899			
REG	REG1	0.792	0.732	0.730	0.578
	REG2	0.729			

5.4.1.2. Validity testing

We conducted CFA to evaluate the construct validity of the survey data, which measures the degree of fit of the model (Hu et al. 2019). Construct validity was assessed by examining convergent and discriminant validity (Chin, Gopal, and Salisbury 1997). Convergent validity is considered acceptable when the average variance extracted (AVE)[69] for the constructs exceeds the minimum threshold of 0.5 (Fornell and Larcker 1981). Additionally, for convergent validity to be deemed satisfactory, items should demonstrate high loadings on their respective factors, surpassing 0.50 (Wixom and Watson 2001; Kim et al. 2008). In terms of discriminant validity,

[69] AVE is a useful measure that indicates convergent validity by showing how well the observed variables represent the latent variables (Farrell 2010). In simple terms, when AVE is high, it shows that a larger proportion of the construct's variance is captured by its indicators and less measurement error is present. Additionally, AVE helps assess discriminant validity by showing the distinctiveness of different constructs in the model (Fornell and Larcker 1981).

it is deemed acceptable when the square root of AVE for each latent variable exceeds the correlation values among other latent variables (Fornell and Larcker 1981; Chin 1998).

Upon examining the results for convergent validity in Table 10, most items exhibited factor loadings that met the suggested level. However, items such as GS1, GS2, PU2, and PU4 had factor loadings at a moderate level, while PEU1 had a low-level loading.[70] Additionally, the AVE of all latent variables exceeded the significant acceptance levels, except for GS, which had an AVE below the acceptable threshold. Regarding the testing of discriminant validity, as shown in Table 11, the square root of AVE for most latent variables exceeded the significant acceptance levels, except for GS, which had a square root of AVE below the correlation values among other latent variables. These statistics indicate a moderate fit rather than a strong fit in terms of the construct validity of the original research model, as suggested by some authors (Fornell and Larcker 1981; Chin 1998; Miles and Shevlin 1998). Consequently, modifications were required to the original research model to investigate how certain items with low factor loadings affected its construct validity (Ganley et al. 2019).

Table 11. Correlations between latent variables (original research model)

	GS	INT	PEU	PR	PU	REG
GS	**0.642**					
INT	0.405	**0.935**				
PEU	0.424	0.648	**0.709**			
PR	0.194	-0.234	-0.027	**0.760**		
PU	0.586	0.636	0.653	0.06	**0.789**	
REG	0.327	-0.129	0.138	0.063	0.192	**0.760**

Note: The diagonal elements represent the square root of the extracted average variance. For adequate discriminant validity, these values need to be higher than the inter-construct correlations.

[70] Miles and Shevlin (1998) noticed three different factor loading levels to be present: low (0.3), medium (0.5), and high (0.7).

5.4.2. Modified research model

In line with Bagozzi, Yi, and Phillips (1991) which studied construct validity in organizational research, it is suggested to carefully analyze the factor loadings of items to identify areas for enhancing construct validity. Adopting this approach, we made adjustments to the research model by excluding items with low factor loadings. Specifically, we began by removing the items with the lowest loading respectively (PEU1, GS4, GS1, PU2, PU4), as indicated in Table 10.

To assess the construct validity further, we conducted additional CFA to examine the factor loadings and identify any problematic items that may indicate issues with construct validity. The results provide evidence for the soundness of the construct validity and support the robustness of the final research model. As presented in Table 12, the convergent validity of the final research model is considered acceptable since the AVE for all constructs is greater than 0.5 (Fornell and Larcker 1981), and the factor loadings for all items exceeded 0.70 (Miles and Shevlin 1998). Moreover, Table 13 illustrates that the final model's discriminant validity is deemed acceptable because the square root of AVE for each latent variable is higher than the inter-construct correlations (Fornell and Larcker 1981; Chin 1998).

In regards to reliability, although the original research model showed reliability at a highly acceptable level, the modifications made to the model further enhanced the internal consistency reliability of the final research model. These enhancements are evident in Table 12, where each latent variable displays Cronbach's Alpha and CR values exceeding 0.7 (Hair et al. 2013).

Table 12. Reliability and validity measures (Final research model)

Constructs	Items	Factor loadings	Cronbach's alpha	CR	AVE
GS	GS2	0.782	0.771	0.767	0.623
	GS3	0.796			
INT	INT1	0.957	0.928	0.933	0.875
	INT2	0.914			
PEU	PEU2	0.767	0.803	0.805	0.676
	PEU3	0.873			
PR	PR1	0.765	0.805	0.805	0.579
	PR2	0.834			
	PR3	0.675			
PU	PU1	0.927	0.915	0.916	0.785
	PU3	0.831			
	PU5	0.896			
REG	REG1	0.718	0.732	0.738	0.581
	REG2	0.804			

Table 13. Correlations between latent variables (Final research model)

	GS	INT	PEU	PR	PU	REG
GS	**0.789**					
INT	0.358	**0.935**				
PEU	0.373	0.654	**0.822**			
PR	0.230	-0.215	-0.020	**0.761**		
PU	0.454	0.656	0.651	0.045	**0.886**	
REG	0.224	-0.157	0.084	0.052	0.102	**0.762**

Furthermore, Table 14 displays the fit statistic indices, indicating that the final research model meets the suggested criteria for model fit. These criteria include CFI > 0.90 (Bentler 1990), TLI > 0.90 (Hu and Bentler 1999), RMSEA < 0.08 (Browne and Cudeck 1993), Chi-square/df < 5.0 (Wheaton et al. 1977), and a significant Chi-square test with a p-value of ≤ 0.05 (Cheng et al. 2006). While most fit indices meet the recommended thresholds, the NFI and GFI exhibit a slightly lower level of fit. This discrepancy can be attributed to the small sample size of this study ($N = 74$). Smaller sample sizes tend to yield NFI values below 1.0, as observed in the study by Bearden, Sharma, and Teel (1982), which found a positive relationship between

NFI mean and sample size. Several studies have noted that NFI and GFI increase with sample size, while TLI's association with sample size is not significant (Anderson and Gerbing 1984; Marsh, Balla, and McDonald 1988; Bollen 1990). In this sense, the difference between the NFI and GFI of the final research model and the recommended thresholds of NFI > 0.90 (Bentler and Bonett 1980) and GFI > 0.90 (Jöreskog and Sörbom 1984) is relatively small. In certain cases, such deviations may still be considered useful, particularly if other fit indices collectively support a good fit (Hu and Bentler 1999; Marakarkandy, Yajnik, and Dasgupta 2017). This further strengthens the reliability and validity of the study's results by demonstrating that the hypothesized model reasonably fits with the observed data.

Table 14. Fit statistic of the final research model

Fit statistic	Achieved
Chi-square	93.290
Number of observations	74
Degrees of freedom (df)	66
Chi-square significance	0.015
Chi-square/*df*	1.413
Comparative fit index (CFI)	0.950
Normed fit index (NFI)	0.854
Tucker-Lewis index (TLI) or (NNFI)	0.931
Goodness-of-fit index (GFI)	0.852
Root mean square error of approximation (RMSEA)	0.074

5.4.3. Endogeneity issue handling: Gaussian copula approach

In our research model, the Partial Least Squares Structural Equation Modeling (PLS-SEM) involves evaluating the connections between the independent latent variables (X) and the dependent latent variable (Y). This helps us estimate the relationships indicated by the path coefficients (β) of X influencing Y through a structural model:

(1) $$INT = \beta_0 + \beta_1 PU + \beta_2 PEU + \beta_3 GS + \beta_4 PR + \beta_5 REG + \varepsilon$$

(2) $$PU = \beta_0 + \beta_1 PEU + \varepsilon$$

(3) $$PU = \beta_0 + \beta_1 GS + \varepsilon$$

(4) $$PEU = \beta_0 + \beta_1 GS + \varepsilon$$

(5) $$REG = \beta_0 + \beta_1 GS + \varepsilon$$

(6) $$PEU = \beta_0 + \beta_1 PR + \varepsilon$$

When considering the potential for a connection between the independent variable X and the error term (ε) of the dependent variable Y, which might lead to an endogeneity problem (in the evaluation of equations 1, 2, 3, 4, 5, and 6), we utilized the Gaussian copula approach. This method, outlined by Papies, Ebbes, van Heerde (2017) and Hult et al. (2018), calculates the Gaussian copula of X using specific equations. This is done to detect and potentially control for any such endogeneity issue in our regression models:

(7) $$c^* = \Phi^{-1}[\mathrm{H}(\mathrm{X}_1)]$$

H(x) represents the actual pattern of how values accumulate, while Φ^{-1} works backwards from the typical distribution of values. To examine the presence and severity of this potential issue, we introduced the copula variable as an additional independent variable into our models. This allows us to account for any correlation between the error term and the potentially endogenous independent construct in the regression models:

(8) $$INT = \beta_0 + \beta_1' PU + \beta_2' PEU + \beta_3' GS + \beta_4' PR + \beta_5' REG + \beta_6 c_1^* + \beta_7 c_2^* + \beta_8 c_3^* + \beta_9 c_4^* + \beta_{10} c_5^* + \varepsilon'$$

(9) $$PU = \beta_0 + \beta_1' PEU + \beta_2 c_1^* + \varepsilon'$$

(10) $$PU = \beta_0 + \beta_1' GS + \beta_2 c_1^* + \varepsilon'$$

(11) $$PEU = \beta_0 + \beta_1' GS + \beta_2 c_1^* + \varepsilon'$$

(12) $$REG = \beta_0 + \beta_1' GS + \beta_2 c_1^* + \varepsilon'$$

(13) $$PEU = \beta_0 + \beta_1' PR + \beta_2 c_1^* + \varepsilon'$$

The significance of the copula coefficients $\beta_6, \beta_7, \beta_8, \beta_9,$ and β_{10} in equation 8, similar to copula coefficients β_2 in equations 9, 10, 11,12, and 13 can assessed through bootstrapping, to help determine if there is a substantial endogeneity problem (Hausman 1978). If these coefficients are significant, it suggests the presence of the endogeneity issue. However, if the copula coefficients are not significant, it indicates that there is no significant endogeneity problem affecting the regression results (Hult et al. 2018).

Table 15. Gaussian copula approach results

Copula variables	P-value
Gaussian copula (Perceived usefulness) -> Intention	0.099
Gaussian copula (Perceived ease of use) -> Intention	0.438
Gaussian copula (Government support) -> Intention	0.672
Gaussian copula (Perceived risk) -> Intention	0.518
Gaussian copula (Regulation) -> Intention	0.972
Gaussian copula (Perceived ease of use) -> Perceived usefulness	0.675
Gaussian copula (Government support) -> Perceived usefulness	0.903
Gaussian copula (Government support) -> Perceived ease of use	0.200
Gaussian copula (Government support) -> Regulation	0.382
Gaussian copula (Perceived risk) -> Perceived ease of use	0.125

Note: * = P <0.05; ** = P <0.01; *** = P <0.001

By conducting this analysis using the Gaussian copula approach in the SmartPLS software, version 4.0.9.4 (Ringle, C. M et al. 2022), we discovered that the copula coefficients were not significant (Table 15). This finding implies that there is no substantial correlation between the independent variables and the error term of the dependent variables, indicating no critical endogeneity issue in our structural equation model.

5.4.4. Hypothesis testing and results

In this study, we test the proposed hypotheses by using Structural Equation Modeling (SEM) to examine the statistical significance of standardized path coefficients through t values in the SmartPLS software. SEM is a powerful statistical method when multiple indicators for each latent variable are first tested through CFA to prove the conceptual soundness of the research model (Schreiber et al. 2006), as indicated in Tables 12, 13, and 14. Generally, the coefficient test is considered significant at the $p < 0.05$ confidence level if the $t > 1.96$, at the $p < 0.01$ level if the $t > 2.58$, and at the $p < 0.001$ level if the $t > 3.1$ (Hu et al. 2019).

After conducting bootstrapping on a two-tailed test in SmartPLS, we obtained the results presented in Figure 16 and Table 16. These results indicate that PU ($\beta = 0.386$, $t = 2.755$) and PEU ($\beta = 0.358$, $t = 2.492$) positively influence INT, while PR ($\beta = -0.251$, $t = 2.209$) and REG ($\beta = -0.250$, $t = 2.234$) have a negative impact on INT. As a result, hypotheses H1, H2, H8, and H10 were supported, as their t-values exceeded 1.96.

Regarding the relationships between other latent variables, we found that PEU ($\beta = 0.560$, $t = 4.194$) significantly affects PU, while GS ($\beta = 0.399$, $t = 2.396$) has a positive influence on PEU. Thus, hypotheses H3 and H6 were supported. However, we observed that GS ($\beta = 0.163$, $t = 1.363$) did not have a significant effect on INT, leading to the rejection of hypothesis H4.

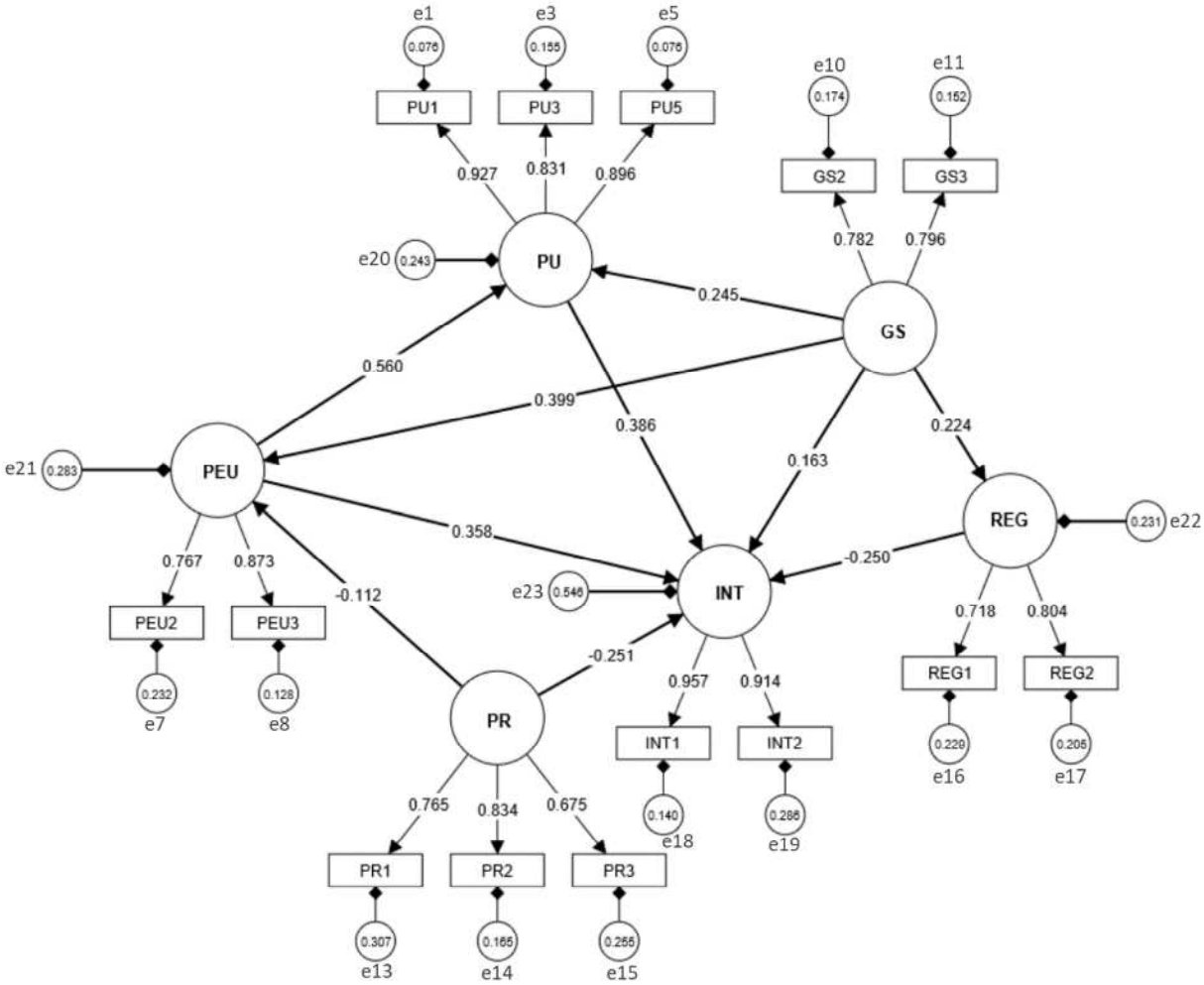
Furthermore, the results revealed that GS ($\beta = 0.224$, $t = 1.407$) did not have a significant impact on REG, and GS ($\beta = 0.245$, $t = 1.927$) also did not significantly affect PU. Additionally, PR ($\beta = -0.112$, $t = 0.774$) had no significant influence on PEU, given that their t-values were below 1.96. As a result, hypotheses H5, H7, and H9 were not supported.

Table 16. SEM results of the final model

Hypothesis	Standardized path coefficients β	S.E.	*t*
H1 (PU -> INT)	0.386	0.253	2.755**
H2 (PEU -> INT)	0.358	0.306	2.492*
H3 (PEU -> PU)	0.560	0.158	4.194***
H4 (GS -> INT)	0.163	0.281	1.363
H5 (GS -> REG)	0.224	0.150	1.407
H6 (GS -> PEU)	0.399	0.184	2.396*
H7 (GS -> PU)	0.245	0.165	1.927
H8 (PR -> INT)	-0.251	0.212	2.209*
H9 (PR -> PEU)	-0.112	0.127	0.774
H10 (REG -> INT)	-0.250	0.279	2.234*

Note: * = P <0.05; ** = P <0.01; *** = P <0.001

Figure 16. SmartPLS graphic of the final research model



Note: The relationship between observed variables and latent variables is represented as follows: The factor loadings (standardized loadings) are displayed in the middle of the arrows, and the error items associated with the observed variables are represented inside small circles. Meanwhile, for the relationship between latent variables, the path coefficients β are shown in the middle of the arrows, and the error items associated with the latent variables are depicted inside small circles.

5.5. Discussion

Empirical evidence suggests that MFIs are more likely to adopt fintech if they think it will be useful. This is in line with the claims of previous studies (Lee 2017; Jiwasiddi et al. 2019; Tun-Pin et al. 2019; Hasan et al. 2021) that perceived usefulness has a significant effect on the intention to adopt fintech. Moreover, this finding suggests that as MFIs gain more confidence in the usefulness of fintech, their likelihood of adopting it increases. In 2021, MFIs in Laos served a significant number of clients, reaching 333,069 individuals, including approximately 93,594 borrowers, and disbursed a total loan amount of 1,525 billion LAK. These figures reflect an impressive 637% increase compared to 2014. Deposits also experienced substantial growth, totaling approximately 1,558 billion LAK, marking a significant surge of 720%. Therefore, to effectively serve their current clients and expand financial services to more underserved and unbanked, MFIs need to improve operational efficiency, reduce costs, enhance service quality, and mitigate risks while expanding their outreach. Consequently, MFIs are more likely to adopt fintech solutions when they perceive them as capable of delivering positive impacts.

Furthermore, this study provides evidence that the perceived ease of use positively affects the intention of MFIs to adopt fintech. This result supports the findings of previous researchers who confirmed that perceived ease of use significantly affects the intention to adopt fintech (Chuang et al. 2016; Meyliana and Fernando 2019; Singh, Sahni, and Kovid 2021). In the specific context of Laos, MFIs may have allocated a dedicated budget to improve the efficiency of their business operations. Consequently, they perceive acquiring specialized hardware and software to support their fintech adoption as a straightforward process. This ease

of use fosters their willingness to adopt fintech when they feel prepared and believe that the adoption process will be effortless. Additionally, this study identifies a positive relationship between the perceived ease of use and the perceived usefulness of fintech. This finding aligns with other studies conducted by Riquelme and Rios (2010), Belanche et al. (2019), Singh et al. (2020), and Setiawan et al. (2021). The positive effect can be attributed to the fact that Lao MFIs believe they are adequately equipped to adopt fintech and can easily access the necessary technological facilities to support its adoption. This, in turn, increases their likelihood of recognizing the benefits of fintech in enhancing the efficiency of their business operations.

The interesting finding of this study is that government support does not have an impact on the intention of MFIs to adopt fintech. This result adds to the ongoing debate about the influence of government support on fintech adoption. It aligns with previous studies that also suggest a lack of significant impact of government support on fintech adoption (Hernandez and Mazzon 2007; Setiawan et al. 2021). However, it is important to note that different findings exist in the academic community, with some studies indicating a substantial influence of government support on fintech adoption (Tan and Teo 2000; Chong et al. 2010; Hu et al. 2019). Furthermore, while government support does not affect MFIs' intentions to adopt fintech, it has a significant impact on perceived ease of use. This finding suggests that government support is critical in improving perceptions of how simple it is to use fintech solutions. The government can help address the challenges and barriers that MFIs may face in adopting fintech solutions by providing adequate support, such as regulatory frameworks and improving the accessibility and quality of telecom, internet, and ICT infrastructure. This, in turn, can enhance the perceived ease of use of fintech adoption.

This study also finds evidence that regulation has a negative impact on the intention of MFIs to adopt fintech. The research highlights the significant barriers created by current

regulations that have made it difficult for MFIs to use fintech. The stability measures standard is one such regulation[71] that makes it challenging for MFIs in Laos to adopt fintech. To comply with these standards, MFIs must meet certain financial ratios such as the capital adequacy ratio, the asset quality ratio, the earnings ratio, the efficiency of implementation, and the liquidity ratio. This can be particularly challenging for MFIs who may struggle to meet these stringent requirements. However, prioritizing fintech adoption by easing existing regulations should be carefully implemented. It is critical to ensure that measures to promote fintech adoption do not jeopardize MFIs' stability. Priorities and fundamental requirements for the stability of MFIs should be considered carefully for a balance between encouraging innovation and preserving regulatory frameworks. To understand the effects of potential regulatory changes on both fintech adoption and MFIs' stability, a comprehensive impact assessment is required.

Prolonged licensing procedures and regulatory uncertainty may also prevent MFIs from adopting fintech. Fintech is a relatively new innovation with complex features, and MFIs may require a high level of stability as well as meeting additional ambiguous requirements throughout the approval process. The lack of clarity surrounding fintech approval procedures may cause MFIs to be hesitant to adopt these technologies until the process becomes more transparent. For instance, the approval process for MFIs to open new branches and units requires three years of consistent net profits and adherence to stability measures. However, the regulatory approval process for other significant changes or innovations remains ambiguous. The approval of digital financial services, such as those provided by the New Concept MFI

[71] This measures criterion is under the regulation on 1) non-deposit microfinance supervision No. 02/BOL, dated 20 June 2008. 2) the regulation on deposit microfinance supervision No. 04/BOL, dated 20 June 2008. 3) the rules on classification of debt and deduction of classified debt of microfinance institutions No. 02/BOL, dated 04 February 2015. 4) the decree on microfinance No. 460/GOV, dated 03 October 2012. 5) the guidance of implementation on microfinance decree No.01/BOL, dated 19 April 2016. 6) the regulation on measures against violators No.845/BOL, dated 20 September 2018.

(NCCMFI), is one notable example. Existing regulations outline the conditions and processes that regulators must follow to approve new financial services of various types. However, the approval conditions and processes for digital financial services are unclear. This lack of clarity can be seen in the NCCMFI's digital financial services, which were launched in 2017 but are still waiting for approval. The absence of well-defined approval conditions and processes has caused extended licensing procedures, with the Bank of Lao PDR serving as the authority to seek authorization. As a result, the uncertainty surrounding the approval of fintech services may reduce MFIs' motivation to adopt these innovations, as they are hesitant to operate an unclear and extensive approval process. Clarifying and streamlining the approval procedures for digital financial services could potentially encourage MFIs to adopt fintech solutions.

This study also finds concerns about consumer protection laws in Laos and how they may negatively impact the adoption of fintech by MFIs. MFIs may be hesitant to use fintech if they feel that neither they nor their customers are adequately protected under current consumer protection laws. For example, the recent failure of Lao Post Deposit-Taking MFI due to capital sufficiency and liquidity problems highlights the need for proper protection of depositors by regulators. The MFI struggled with inefficient internal operations and faced consumer panic, which ultimately led to many depositors losing their money. In June of 2022, consumers could not withdraw deposits totaling over 17 billion LAK, including over 1.5 billion LAK of interest-rate earnings in the savings account.

Based on these findings, this study suggests that the successful integration of fintech within the MFI sector requires a proper regulatory framework and efficient implementation. To promote fintech adoption, policymakers and regulators should address any existing regulatory barriers that impede the integration of fintech within MFIs. This may involve re-evaluating the stability measures standard and considering the challenges it poses for MFIs. Additionally,

policymakers and regulators should work towards providing clearer guidelines for the approval process of fintech innovations, especially for significant changes or innovations that are broadly defined by regulations. Strengthening consumer protection laws is also vital to instilling confidence in MFIs and their customers. When people feel safe using financial services, they are more likely to start using new financial technologies. This benefits everyone involved, including the customers, MFIs, and the economy as a whole.

Finally, this study finds that perceived risk negatively affects the intention of MFIs to adopt fintech, which is consistent with results from studies in mobile banking and fintech. For example, perceived risk was found to be a significant barrier to the adoption of mobile banking. One of the main reasons why more people do not adopt mobile banking is that they are afraid of using it. A common concern among users is that their identification numbers might fall into the wrong hands, allowing unauthorized parties access to their financial data (Al-Jabri and Sohail 2012). In addition, Slade et al. (2015) found that perceived risk negatively affects the intention to adopt mobile payment because it increases the anxiety of non-users about the possible consequences of using such technology. According to Swinyard and Smith (2003), many newly introduced products are inherently perceived as risky. Security and privacy concerns have previously hampered e-commerce acceptance, and have been identified as significant barriers to online transaction adoption, particularly among individuals who have not yet adopted these technologies. Similarly, multiple studies in the field of fintech have reported that perceived risk is the core inhibitor for fintech platform adoption because users worry about the unpredictability and complexity of fintech (Ryu 2018; Ryu and Ko 2020; Xie et al. 2021). There will be uncertainty and risks with fintech, as with most new financial products and services. This evidence demonstrates that Lao MFIs are less likely to use fintech when they believe there will be a significant level of risk involved. Therefore, to deal with the risks and

support the use of fintech by MFIs, this finding suggests that the government of Laos should set up a "regulatory sandbox" where MFIs may begin testing out fintech innovations in control space.[72] By doing so, MFIs will be granted permission to adopt and use fintech in a restricted area and within an appropriate timeframe where the regulator (BOL) will provide adequate regulatory assistance by easing specific legal and regulatory restrictions. There will be enough safety measures to limit the damage if something goes wrong. It will also help BOL bring in the right regulatory technology (RegTech) to deal with the risks of fintech.

5.6. Concluding remarks

In light of the pivotal roles that MFIs and fintech are playing, the integration of fintech within MFIs offers a transformative opportunity to enhance operational efficiency, stability, and the scope of financial inclusion. This study is specifically focused on the adoption of fintech within MFIs in Laos, a country with a dynamic financial landscape and ongoing digitalization efforts.

Laos' unique context offers a compelling backdrop for studying fintech adoption, given its evolving financial landscape and the microfinance sector's vital role in promoting financial inclusion. Despite its development challenges, Laos has made significant economic strides, achieving consistent growth even amid regional crises. However, financial exclusion remains a significant concern, with a substantial portion of the population lacking access to basic financial services. To address this, a financial inclusion roadmap has been developed, focusing on expanding MFIs to improve financial access for marginalized populations.

While the microfinance sector in Laos has experienced significant growth, this expansion also brings challenges such as credit default risks for vulnerable clients, which could

[72] In the context of a regulatory sandbox, a controlled space is an environment where companies can test innovative products, services, and business models without being immediately subjected to the full regulatory requirements that would normally apply.

impact financial stability. Fintech adoption presents a viable solution to manage these risks, enhance stability, and promote sustainable financial inclusion. However, fintech adoption in Laos has been relatively slow compared to neighboring ASEAN countries.

Laos is making strides in improving digital connectivity and digital financial services, with collaborations between banks, financial institutions, and the central bank aiming to introduce innovative fintech solutions. Given this context, this study investigates fintech adoption within MFIs in Laos. It employs a theoretical model based on the TAM, considering perceived risk, government support, and regulation as factors influencing fintech adoption. The model is empirically validated through a questionnaire distributed to managing directors of MFIs and analyzed using SEM. The results endorse the extended TAM model's efficacy in predicting factors impacting MFIs' intention to adopt fintech.

This study sheds light on the potential of fintech adoption within MFIs in Laos, considering both the challenges and opportunities presented by the country's financial landscape and digitalization efforts. By exploring the factors influencing fintech adoption and validating a theoretical model, this research contributes to understanding the dynamics that can enhance financial inclusion and stability in Laos.

Moreover, this study focuses on the adoption experiences of future or non-users of fintech, identifying the factors that contribute to the intention to adopt fintech among this group, shedding light on their specific concerns, needs, and perceptions. This approach expands the understanding of fintech adoption beyond the experiences of existing users, offering a broader perspective on the adoption process. This contributes to the existing body of knowledge by providing insights into the unique challenges faced by non-users and informing strategies to address these barriers and promote fintech adoption among this important segment of the population.

Furthermore, this study also illustrates the significant barriers imposed by current regulations, especially the stability measures standard, which hinders MFIs from embracing fintech. By identifying these regulatory challenges, this study contributes to a better understanding of the regulatory landscape and its implications for fintech adoption in the MFI sector. This study also emphasizes the negative impact of perceived risk on the intention to adopt fintech by MFIs. This finding aligns with studies in the mobile banking and fintech fields, indicating that perceived risk is a crucial inhibitor for the adoption of new financial technologies. The recognition of this risk factor highlights the need for appropriate risk management strategies and mechanisms to address the concerns of MFIs and foster their confidence in adopting fintech.

Accordingly, this study significantly contributes to the development of knowledge in the field of fintech adoption. The findings offer theoretical insights and provide practical implications for policymakers, regulators, and practitioners seeking to promote the successful adoption of fintech in the MFI sector. By understanding the critical drivers of adoption and addressing the identified barriers, stakeholders can harness the potential of fintech to enhance operational efficiency, foster financial inclusion, and contribute to the overall development of the microfinance sector.

Chapter 6. Conclusion

6.1. Summary

Financial inclusion, which aims to provide formal financial products and services to everyone, has been increasingly recognized for its significant societal benefits, including poverty reduction, decreased income inequality, financial stability, and economic growth. However, financial exclusion, affecting billions of working-age adults worldwide, remains a persistent challenge, affecting poor individuals and limiting their access to essential financial services.

In Laos, the issue of financial exclusion is a significant concern, with only 47% of adults having access to formal financial services. Despite efforts outlined in the FIRM, banks have shown limited commitment to expanding access, and many planned activities have not been successfully completed. Additionally, informal finance options like VFs face performance challenges and uneven progress in addressing financial exclusion. MFIs have emerged as a promising solution in Laos compared to VFs, given their better management, regulatory compliance, and capacity to serve marginalized populations effectively. Compared to commercial banks, MFIs are better positioned to advance financial inclusion by reaching underserved populations, providing simple services, and remaining accessible to those excluded from the formal financial sector.

Numerous empirical studies have demonstrated the positive impact of MFIs on reducing poverty, income inequality, and social disparities. In Laos, the microfinance sector is rapidly expanse, driven by high demand for formal financial services. MFIs have outperformed commercial banks, with a significant increase in deposits (720%) and credit (637%). Moreover, the number of MFIs has surged by 173%, highlighting their vital role in promoting financial inclusion for marginalized and low-income populations. However, the rapid expansion of MFIs

in Laos poses challenges to their performance and potential risks, particularly in terms of credit defaults when serving vulnerable groups.

The performance and credit default risk of MFIs in Laos are then examined using a variety of CAMEL ratios in this dissertation. The findings highlight the challenges that MFIs face in the country, which reflect similar issues that MFIs encounter in other developing countries. The problems such as low profitability due to a low return on equity and return on assets, as well as operational inefficiencies. In addition, the issue of credit default risk as a result of ineffective loan management that evidenced by excessive write-offs and a portfolio at risk. The study emphasizes the importance of enhancing MFI performance and risk management to improve their efficiency and stability.

The adoption of fintech solutions has the potential to drive efficiency and enhance the financial stability of MFIs in Laos, allowing them to offer improved financial services to a broader customer. This aligns with the critical rules for Laos to adopt fintech as a means of addressing existing gaps within its financial landscape. This dissertation explores the possible outcomes of adopting fintech in terms of how it might affect the efficiency, stability, and social impact of MFIs in Laos. By establishing this foundational understanding, the groundwork is laid for the development of more comprehensive and sustainable financial strategies in the country. Additionally, the study emphasizes the importance of addressing the risks associated with fintech solutions, as well as the need for a balance between relationship and transaction banking to maximize the benefits of fintech solutions for MFIs and financial inclusion in Laos.

This dissertation further examines the factors that influence and inhibit the intention of MFIs in Laos to adopt fintech. It develops a comprehensive model that incorporates government support, perceived risk, and regulation, in addition to the original TAM variables, to predict the factors that impact MFIs' intentions towards the adoption of fintech. Using SEM to test the

proposed model, the empirical evidence indicates that perceived usefulness and perceived ease of use are key drivers of the intention of MFIs to adopt fintech, while perceived risk and regulation are significant barriers that hinder their intention. The results provide robust support for the extended TAM, underscoring its effectiveness in predicting the factors that affect MFIs' intention to adopt fintech solutions. Moreover, the study highlights the importance of adding the role of influenced factors in the environment of fintech initiatives and removing barriers to support fintech adoption, improve financial operations, and promote greater social impact through financial inclusion in the country.

6.2. Contributions

This dissertation makes significant contributions to our understanding of the financial inclusion challenges in Laos. It examines how MFIs operate and manage credit risk, shedding light on their financial stability and role in increasing financial inclusion. In addition, the study establishes a foundation for understanding how fintech adoption can potentially enhance the efficiency, stability, and social impact of MFIs.

More importantly, this dissertation enriches the TAM through empirical contributions that extend its theoretical development. It specifically combines additional variables such as government support, perceived risk, and regulation into the TAM framework and applies this extended model to examine fintech adoption in the context of MFIs in Laos. It is worth noting that these newly added variables correspond to the foundational TAM variables introduced by Davis (1986). The integration of these variables is expected to strengthen the TAM's theoretical foundations, promoting a more comprehensive understanding of fintech adoption within the unique setting of MFIs. Through this approach, the study enhances the credibility and relevance

of TAM, contributing to a more robust theoretical framework for understanding fintech adoption within the scope of MFIs.

Consequently, there is clear evidence that this dissertation contributes to the advancement of knowledge in the fields of performance, credit default risk, fintech adoption, and the social impact of MFIs. The findings provide theoretical insights and practical implications for policymakers, regulators, and practitioners seeking to enhance the efficiency and stability of MFIs, promote social impact, and drive financial inclusion progress in the country. By validating findings through empirical analysis and offering practical recommendations, this thesis is important for guiding the effective adoption and integration of fintech solutions within MFIs. These insights contribute to the growth and improved performance of MFIs, enabling them to better serve low-income individuals, marginalized communities, small business owners, and others who may have limited access to traditional financial services. This leads to improved financial services, increased access to finance, and expanded opportunities for economic advancement.

6.3. Limitations and future research

The findings of this dissertation on fintech adoption are limited to developing countries comparable to Laos. Future research should compare models across developing countries to identify similarities and differences in fintech adoption in MFIs. In addition, the research model for fintech adoption would be more robust with a larger sample size. Furthermore, while this study offers a preliminary examination of the impact of regulations on adoption intentions, it provides only a general explanation of these effects. Future research should concentrate on specific regulations to gain a clearer understanding of how specific laws, acts, and rules can influence adoption intentions. Broadening the study's scope to include the demand side and a

variety of financial institutions would enhance the comprehensiveness of the investigation into fintech adoption within the financial sector.

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Appendixes

Appendix A. A questionnaire

Characteristics	Answer	
What is the type of your MFI?	☐ Deposit Taking MFI	☐ Non-Deposit Taking MFI
How long has your MFI been established?	☐ Under 1 year ☐ 2 years ☐ Other (Specify)	☐ 1 year ☐ 4 years
Does your MFI have a branch?	☐ Yes	☐ No
Does your MFI have a unit?	☐ Yes	☐ No
How much is the authorized capital of the MFI?	☐ Less than 1 billion LAK ☐ 3-5.9 billion LAK ☐ Over 10 billion LAK	☐ 1-2.9 billion LAK ☐ 6-10 billion LAK

Latent Variables	Questions	Please answer to questions by ticking your choice in the box (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree)
Perceived Usefulness (PU)	1) To what extent do you think using fintech will benefit your MFI?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	2) To what extent do you think using fintech will save the operating cost of your MFI?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	3) To what extent do you think using fintech will improve the quality of products and services of your MFI?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	4) To what extent do you think using fintech will make your MFI sustainable?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	5) To what extent do you think using fintech can support financial inclusion?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Perceived Ease of Use (PEU)	1) To what extent do you think using fintech is easy without hard effort?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	2) To what extent do you think your MFI is easy to have the equipment that supports the use of fintech such as servers, computers, electronic devices, Internet, Software, etc.?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	3) To what extent do you think your MFI is ready to start using and providing fintech services to customers?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Perceived Risk (PR)	1) To what extent do you think using fintech will cause financial risk to your MFI?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	2) To what extent do you think using fintech will cause the security risk that your MFI will damage by cyber-attacks?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	3) To what extent do you think using fintech will cause operational risk to your MFI?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Government Support (GS)	1) To what extent do you think government support will help your MFI in fintech usage?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	2) To what extent do you think the government has introduced new legislation and revised existing regulations to reduce barriers to fintech usage and support fintech services?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	3) To what extent do you agree that the government, especially the Bank of the Lao PDR, should have a sandbox pilot protocol that allows operators to experiment and use fintech?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	4) To what extent do you think the government set up all kinds of infrastructure, namely telecom networks and information communication technology (ICT), that promote and support the use of fintech?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Regulation (REG)	1) To what extent do you think the microfinance-related regulations created difficulties, prevented, and slowed your MFI intention to use fintech?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	2) To what extent do you think the law on consumer protection is being used ineffectively and inefficiently?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Intention (INT)	1) To what extent do you think your MFI intends to use fintech?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
	2) To what extent do you think your MFI is likely to use fintech as soon as possible?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5