



Building Resilience in the Geoeconomic Fragmentation: The Role of MFI Transitions to Banks in Cambodia's Financial Development

Chhorn Dina, Muth Sumontheany, and Houy Sivly

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Banks in Cambodia's Financial Development**

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Author(s) and affiliation(s):

Chhorn Dina

Centre director, Cambodia Development Resource Institute

Affiliated researcher, University of Bordeaux, France

Muth Sumontheany

Trainee official, National Bank of Cambodia

Houy Sivly

Research assistant, Cambodia Development Resource Institute

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CDRI

📍 56 Street 315, Tuol Kork

✉ PO Box 622, Phnom Penh, Cambodia

☎ +855 23 881 701/881 916/883 603

@ cdri@cdri.org.kh

🌐 www.cdri.org.kh

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Acronyms and abbreviations

ABC	Association of Banks in Cambodia
AC	Agricultural Cooperative
ACLEDA	The Association of Local Economic Development Agencies
AMRET	Amret Microfinance Institution
AR1	First-order Serial Correlation
AR2	Second-order Serial Correlation
CB	Commercial Banks
CBC	Credit Bureau Cambodia
Coef	Coefficient
CRS	Congressional Research Service
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IDLO	International Development Law Organization
IFS	International Financial Statistics
IMF	International Monetary Fund
INEF	Institute for Development and Peace
KHQR	Khmer Quick Response Code
LOLC	LOLC (Cambodia) PLC
MDI	Microfinance Deposit-taking Institution
MFI	Microfinance Institution
MSMEs	Micro, Small, and Medium Enterprises
NBC	National Bank of Cambodia
NGO	Non-Governmental Organisation
NPLs	Non-performing Loans
ODA	Official Development Assistance
OLS	Ordinary least squares
PAR	Portfolio At Risk
PPP	Purchasing Power Parity
PRASAC	Programme de Réhabilitation et d'Appui au Secteur Agricole du Cambodge
RGC	Royal Government of Cambodia
SB	Specialized Banks
SE	Standard Error
US	United States of America
UN	United Nations
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development
USD	US Dollars
WITS	World Integrated Trade Solution
WUI	World Uncertainty Index

Executive summary

In a geoeconomic fragmentation, Cambodia's financial sector faces the challenge of enhancing inclusion while safeguarding stability. The transition of microfinance institutions (MFIs) into banks marks possibly a significant step toward resilience, offering opportunities to expand credit access and absorb external shocks.

Analysing panel data from 120 financial institutions (2013-2023), the core objective of this research is to assess the impact of MFIs transitioning to banks on Cambodia's financial development in a fragmented world. The specific objectives include:

- (1) *Analysing the implications of MFIs transitioning to banks for financial inclusion and financial risk in Cambodia; and*
- (2) *Investigating the role of these transitions in promoting economic resilience, particularly in a world characterised by the geo-economic fragmentation.*

From the estimated results of the models, we suggest the following hypothesis based on two distinct time periods. *During the pre-pandemic phase*, loan access, an indicator of financial inclusion, is primarily driven by the persistence of prior loan access. Non-performing loans (NPLs), an indicator of financial risk, are significantly influenced by lagged NPLs, economic growth, and the size of financial institutions in terms of assets and equity, highlighting the potential for over-lending during economic booms. Notably, NPLs declined during this period, largely due to the positive effects of transitioning MFIs to banks. *In the post-pandemic period*, the landscape has shifted. NPLs rose due to the adverse impacts of the global pandemic. However, MFI transitioning into banks helped mitigate these effects. While global uncertainty correlates with reduced NPLs, likely reflecting more conservative lending, it did not significantly impact loan access. Importantly, transformed institutions expanded their branch networks more than their non-transformed counterparts, which became more pronounced during the post-pandemic recovery period. Our hypothesis is that financial institutions that transitioned are more responsive to global uncertainty, suggesting heightened sensitivity to both risk and opportunity in a fragmented international environment.

Policy recommendations for strengthening financial resilience in Cambodia amidst global geoeconomic fragmentation must include a balanced approach to financial inclusion and risk management. Given the persistence of high NPLs, there must be enhanced regulatory oversight through stress testing, onsite inspections, and resolution mechanisms. Better credit assessments should be enforced to ensure loan quality, thereby prioritising productive loans over non-productive lending. Accelerating the establishment of a deposit insurance system would enhance financial stability while reducing dependency on volatile foreign capital by prioritising domestic capital mobilisation. Additionally, encouraging mergers and acquisitions can improve institutional efficiency and resilience, though transitioning MFIs into banks should be driven by sustainable growth rather than regulatory pressures. The role commercial banks play in microcredit should be limited to prevent redundancy with MFIs.

Key detailed findings from the estimated results are summarised in the table below.

Model A: Effect of MFIs transitioning to banks on loan accessibility	• The results suggest financial inclusion was driven primarily by prior access to financial services, indicating a self-reinforcing dynamic. • No strong evidence that institutional or macroeconomic factors (equity-asset ratio, profitability, GDP growth, lending rates) significantly improve loan access. • Post-transition to bank status does not clearly increase loan accessibility, raising doubts about whether regulatory upgrading alone widens outreach. • No significant interaction between institutional transition and the post-COVID period on loan access. • Geoeconomic or macro shocks (e.g., lending rate changes) have minimal effect on loan accessibility.
Model B: Effect of geoeconomic fragmentation on loan accessibility	• World Uncertainty Index (WUI) shows weak influence on access to loans, indicating external uncertainty does not strongly disrupt financial inclusion. • Institutional transformation and global fragmentation do not independently drive financial outreach, suggesting other domestic or behavioural factors are more critical.
Model C: Effect of MFIs transitioning to banks on NPLs	• Transitioning MFIs to banks significantly reduces NPLs, reflecting stronger regulation, improved risk control, and enhanced oversight. • Post-transition * post-pandemic interaction indicates upgraded institutions were more resilient to COVID-19 shocks. • Post-pandemic period led to higher NPLs, highlighting persistent borrower distress. • Positive relationship between economic growth and NPLs suggests risk of over-lending during booms. • Historical NPL levels strongly predict future NPLs, stressing the need for early intervention. • Larger institutions tend to face higher NPLs due to wider risk exposure. • Higher equity-assets ratio may be associated with riskier lending behaviour, requiring stronger prudential supervision.
Model D: Effect of geoeconomic fragmentation on NPLs	• Transitioning MFIs to banks remains important in enhancing financial stability under global uncertainty. • Interaction of transition and WUI reveals that upgraded institutions show greater resilience during global shocks. • Negative WUI coefficient suggests institutions adopt more cautious lending during uncertainty, reducing NPLs.
Model E: Effect of MFIs transitioning to banks on the number of branches of financial institutions	• Transformed institutions expand branch networks more aggressively than non-transformed MFIs. • Expansion is especially strong post-pandemic, indicating institutional upgrading supports both stability and growth.
Model F: Effect of geoeconomic fragmentation on the number of branches of financial institutions	• Global uncertainty exerts a modest influence on institutional expansion. • Transformed institutions are more sensitive and responsive to international risk dynamics, suggesting higher strategic awareness and adaptability.

1. Introduction

In a world where economic ties are growing deeper yet more fragile, Cambodia's increasing integration into global economy brings new opportunities while also presenting potential risks that may challenge its efforts to enhance financial inclusion and maintain stability, particularly in the context of rising geoeconomic fragmentation. The risk of geoeconomic fragmentation has become increasingly evident. Since the 2007-08 global financial crisis (GFC), a series of global events have accelerated divisions across the world, including Brexit, US-China trade tensions, the COVID-19 pandemic, the Russia-Ukraine war, and other ongoing conflicts. Additionally, China's GDP, measured by purchasing power parity (PPP), surpassed that of the US in 2013, further intensifying global economic pressures (see, CRS 2015; Aiyar, Presbitero, and Ruta 2023; Aiyar et al 2023).

Geoeconomic fragmentation has significantly impacted international trade, technology, and financial systems by disrupting global flows of goods, capital, and labour while increasing trade restrictions. Aiyar et al. (2023) highlights that fragmentation increases challenges in trade and technology, reduces cross-border labour efficiency, hinders innovation, exacerbates demographic issues, and restricts external financing options, thus decreasing economic development. Jean (2024) explains that geopolitical tensions and strategic competition among great powers increasingly shape the global economy, driving fragmentation through trade and industrial policies. Similarly, Norring (2024) underlines rising challenges in global trade and finance as globalisation retreats, trade growth slows, and global value chains shift from efficiency-driven to resilience-focused frameworks.

Geoeconomic decoupling also poses significant challenges for Cambodia due to its close economic ties with China and the US, its largest import and export partners, respectively (WITS 2022). Globally, trade tensions and protectionist policies between the world's two greatest economies have disrupted trade flows, foreign direct investment (FDI), and capital markets. Such actions have slowed China's economic growth and reduced Cambodia's growth prospects (Aiyar et al. 2023). Cambodia's reliance on China as its largest bilateral donor, lender, investor, and trading partner increases these risks (Menon 2023). In addition, Cambodia's financial sector faces the dual challenge of enhancing inclusion and maintaining stability in a fragmented global economy. This highlights the country's dependence on foreign capital inflows, particularly official development assistance (ODA) and FDI, both of which make the economy vulnerable to external shocks. The lack of domestic fundraising platforms, such as a bond market or a strong stock exchange, deepens this reliance. While foreign direct investment into Cambodia's banking sector has supported fund mobilisation, the economy remains vulnerable to shifts in investor sentiment and external conditions that may affect the stability and sustainability of these inflows (see, Aiba 2023; Aiyar et al 2023).

In recent years, Cambodia's financial sector has undergone significant changes as MFIs transition into banks, particularly during the post-pandemic period. Notable organisations that have made this transition include Sathapana Microfinance Plc, which became a commercial bank in 2012 after its acquisition by Japan's Maruhan Bank, and Prasac MFI Plc, which transitioned in 2023 after it was acquired by South Korea's KB Kookmin Bank for USD1 billion (Amarthalingam 2023). In a bid to expand its overseas business, Bank SinoPac announced plans to acquire Amret Plc, a leading financial institution in Cambodia, in 2024 further underscoring foreign

investors' growing interest in Cambodia's financial sector (Sinopac 2024). These transitions hold the potential to reshape the country's financial landscape by promoting financial stability, economic resilience, and greater access to credit for households and businesses. While the transition offers significant opportunities for improving financial resilience, it is not without risks, especially, since this transformation is occurring within a context of increasing global economic fragmentation.

Similarly, academic literature on this topic highlights mixed results of such transitions. Transitioning MFIs into banks can enhance financial resilience by increasing credit availability and reducing dependency on foreign capital, improving efficiency, rising economies of scale in large banks, and promoting banks' performance in response to external shocks (see, Bárcenas, Barreiro, and Pagliacci 2016; Allen and Liu 2007; Mitchell and Onvural 1996; Shaffer and David 1991; Kolari and Zardkoohi 1991; Baltensperger 1972; Benston 1972). However, the process is not without challenges. Risks include mission drift, increased regulatory burdens, and operational inefficiencies. Studies suggest that the commercialisation of microfinance may undermine social objectives, leaving vulnerable groups underserved. Additionally, stricter regulatory and capital requirements can negatively impact smaller MFIs, potentially leading to financial instability (see, for example, Hermes, Lensink, and Meesters 2011; Cull, Demirgüç-Kunt, and Morduch 2009; Simper 1999). This study aims to explore how the transition of MFIs into banks contributes to Cambodia's financial development and resilience in a fragmented global environment.

The core objective of this study is to assess how MFIs transitioning to banks impacts Cambodia's financial development. The specific objectives include:

- Analysing the implications of MFIs transitioning to banks for financial inclusion and financial risk in Cambodia.
- Investigating the role these transitions play in promoting economic resilience, particularly in a world characterised by geoeconomic fragmentation.

The paper is structured as follows: Section 2 reviews the relevant literature. Section 3 outlines the methodology employed. Section 4 presents the empirical findings, while Section 5 concludes with policy implications and recommendations for strengthening financial resilience in Cambodia.

2. Literature review

2.1. Geoeconomic fragmentation and its implications

What had been a risk of geoeconomic fragmentation has recently become more certain. After the 2007-2008 global financial crisis, many global events occurred that further deepened global divisions, including Brexit, US-China trade conflicts, the COVID-19 pandemic, the Russia-Ukraine war, and other ongoing conflicts. China's GDP surpassed that of the US in 2013 when measured using PPP (CRS 2015), which has also created significant pressure. According to Aiyar et al. (2023, 4),

After decades of increasing global economic integration, the world is facing the risk of fragmentation. A shallow and uneven recovery from the GFC was followed by Brexit, US-China trade tensions, and a growing number of military conflicts. The post-GFC era has seen a levelling-off of global flows of goods and capital, and a surge in trade restrictions. The COVID-19 pandemic and Russia's invasion of Ukraine have further tested international relations and increased scepticism about the benefits of globalization.

Shekhar and Anna (2023) explained that while the direction of globalisation remains uncertain, the world is likely to become more multi-polar amidst the risk of runaway geoeconomic fragmentation. Geoeconomic fragmentation impacts various sectors, particularly international trade, technology, and the financial system, by disrupting global flows of goods and capital and increasing trade restrictions. The possibility of a more fragmented global economy, with deeply divided global supply chains and financial systems, is growing. Aiyar et al. (2023, 16) the world is facing the risk of policy-driven geoeconomic fragmentation (GEF suggested that:

Geo-economic fragmentation is likely to affect the global economy through several other channels, amplifying the impact from trade and technology fragmentation. For example, rising barriers to cross-border labour flows could reduce efficiency, hinder innovation and technological diffusion and worsen adverse demographic trends. The fragmentation could hinder cross-border capital flows, reducing the options for external financing and impeding economic development.

Jean (2024, 4) explained that “it has become received wisdom to consider the world economy as increasingly shaped by forces of fragmentation, resulting from geopolitical tensions and strategic competition between great powers, including through trade and industrial policies.” Norring (2024) underscored the growing turbulence in global trade and finance due to geopolitical tensions and the shift from efficiency-driven global value chains to resilience-focused frameworks. Norring (2024, 1) explained additionally that the “world is witnessing growing turbulence stemming from geopolitics and a tangible threat of economic disintegration. There are some indications of globalization in retreat, international trade growth slowing down and a transition from optimizing efficiency of global value chains towards ensuring their resilience.”

The geoeconomic fragmentation impacts economies closely linked to Cambodia, particularly China as Cambodia’s largest import source and the US as Cambodia’s largest export partner (WITS 2022). Globally, China remains the centre of global trade, while the US serves as the hub for FDI (Hudecz et al. 2024). Ongoing protectionist measures and countermeasures between the world’s two greatest economies have increased trade tensions (Aiyar et al. 2023). Since the beginning of the trade war and the implementation of COVID-related restrictions in China, the country’s economic growth has significantly slowed. This slowdown brings uncertainties that disrupt global trade flows, FDI, and capital markets, all of which also reduce Cambodia’s growth prospects. These risks are further emphasised for Cambodia because China is its largest bilateral donor, lender, investor, and trading partner (Menon 2023).

In a fragmented global economy, Cambodia’s financial sector development has also faced the challenge of enhancing inclusion while safeguarding stability. Aiba (2023) stated Cambodia’s reliance on foreign capital inflows, like ODA and FDI, makes its economy vulnerable to external shocks, especially due to unstable bank inflows. According to Aiba (2023, 4-5):

Cambodia is a highly open economy, and the Cambodian government has adopted a liberal stance toward foreign investment and trade, leading to huge capital inflows. Most capital inflows are in the form of ODA, FDI, and other investments. Although capital inflows into banks are primarily FDI, they are not entirely stable as they remain sensitive to changes in foreign investors’ sentiment and external conditions. Thus, a high dependency on foreign funding as a result of borrowing or deposits is likely to make the entire economy vulnerable to external shocks.

The study also highlighted the significant lack of domestic fundraising platforms in Cambodia, which makes the country to continue relying on foreign capital. This dependency exposes the Cambodian economy to external financial fluctuations and vulnerabilities. Aiba (2023, 5) suggested that:

In the case of Cambodia, recent capital flows are volatile and the main driver is inflows into the banking sector. The banking sector plays a pivotal role in fund mobilization in Cambodia, since there is no other formal financial market functioning in the country: there is no bond market, and although a stock exchange market was opened in 2011, only five companies were listed as of 2017.

The effect of geoeconomic fragmentation is also potentially linked to interest rates, exchange rates, and inflation in Cambodia due to its multifaceted impact on supply-chain disruptions and foreign direct investment (FDI). Emerging market and developing economies are highly vulnerable to FDI relocation, which creates additional uncertainty (see, for example, IMF 2023). This scenario is likely to have an impact on the Cambodian national currency “Riel”, higher borrowing costs due to international capital flow restriction, and instable inflation due to fluctuation of Cambodia’s trade, especially from China and the US, which are key players in the geopolitical divide.

At the country and financial institutional levels, the rise of geoeconomic fragmentation also affects financial services and increases risks for financial institutions within a given country. Aiyar et al. (2023, 3) explained:

An increase in geopolitical tensions with major partner countries could cause a sudden reversal of cross-border capital flows, with the impact being notably larger for emerging and developing economies. These patterns could pose macro-financial stability risks through an increase in banks’ funding costs, a decline in their profitability, and lower credit provision to the private sector.

Aiyar, Presbitero, and Ruta (2023) also examined the implications of macro-financial volatility, emphasising the need for diversification strategies to mitigate potential risks. They argued that “financial fragmentation could exacerbate macro-financial volatility in the longer term by reducing international risk diversification opportunities in the face of adverse domestic and external shocks.”

2.2. Development of MFIs and its role in Cambodian financial sector

2.2.1. History of MFIs in Cambodia

Cambodia’s microfinance sector was first introduced in the early 1990s. It was initially developed by non-governmental organisation (NGO) following the Paris Peace Accords in 1991. NGOs played a critical role in providing rehabilitation and reconstruction work for the poor, particularly refugees. At the initial stage, the Royal Government of Cambodia (RGC) prioritised developing rural finance to reduce poverty and foster economic growth, especially in agriculture. Over time, NGOs shifted their focus to microfinance as a mechanism for poverty reduction and economic development, retaining their focus in rural areas where banking services were inaccessible (NBC 2007).

Early in the 1990s, preliminary microfinance programmes were supported by international organisations like the United Nations (UN), particularly the United Nations International Children’s Emergency Fund (UNICEF), the United States Agency for International Development

(USAID), and the World Bank. Initial efforts focused on converting local initiatives into village banks that provided emergency aid and small loans, which laid the foundation for the sector. Key players like The Association of Local Economic Development Agencies (ACLEDA) and the EU Commission Programme de Réhabilitation et Appui au Secteur Agricole du Cambodge (PRASAC) transitioned from development programs to registered MFIs, enabling large-scale financial inclusion in rural areas. By the mid-1990s, MFIs such as AMRET, LOLC, and Sathapana Bank expanded their operations by offering loans nationwide and establishing dense networks to serve underserved communities, further transforming Cambodia's financial landscape (see details in Bliss 2022). The microcredit delivery includes individual loans, solidarity groups, village banks, and self-help groups (IDLO 2008, 2).

In the 2000s, the NBC began regulating and licensing MFIs to formalise their operations. This marked the transformation of many NGOs into licensed or registered MFIs. The NBC introduced the *Law on Banking and Financial Institutions* (1999) and the *Prakas on Registration and Licensing of Microfinance Institutions* (2000) to provide a legal framework for licensing MFIs as formal financial entities (see NBC 1999 and NBC 2000). Under the Prakas, large MFIs were required to obtain a license, medium-sized MFIs were only required to register, and small MFIs were exempt from registration (NBC 2000). Vada (2010) referred to this period as the commercialisation phase of microfinance. The first MFI to take action was ACLEDA. By the end of 1999, ACLEDA had an outstanding portfolio of USD13.7 million, which represented a 37 percent increase from the previous year (Mot 2010).

According to NBC (2007, 4), “for the first time in 2000, the NBC issued regulations on the classification of MFIs, classifying all MFIs into three categories according to the level of their operations with different criteria for being licensed and registered.” According to ABC (2024), financial institutions were classified into three categories: full commercial banks (minimum USD13 million paid-up capital), specialised banks (minimum USD2.5 million paid-up capital), and licensed/registered MFIs. As stated by NBC (2007, 9), “Of the 15 commercial banks, one bank has transformed from an NGO operating microfinance into a specialized bank and at last, a commercial bank (ACLEDA Bank). ACLEDA Bank has the largest network all over the country, in the cities and in remote areas of the countryside. ACLEDA Bank provides both commercial banking and rural financial services.”

The MFI sector has since continued to grow. Its growth has aligned with Cambodia's strong economic performance, averaging an over 7 percent GDP growth rate over the past three decades. Many MFIs have been established, and some have evolved into specialised and commercial banks. In 2006, Cambodian microfinance grew remarkably. There were 17 licensed MFIs, 26 registered rural credit operators, and around 60 NGOs freely operating in the whole country (NBC 2007, 3). By the end of 2011, the banking sector in Cambodia consisted of 31 commercial banks, of which 22 were local incorporated banks and 9 foreign bank branches, 7 specialised banks, including one state-owned bank, 32 licensed MFIs where 7 eligible to collect customer deposits, and 29 registered MFIs (NBC 2011, 1).

Today, Cambodia's banking system operates under a two-tier structure. The public sector is represented by the NBC, while the private sector includes commercial banks, specialised banks, MFIs, and NGOs engaged in rural credit activities (NBC 2024). The NBC Annual Report 2023 (NBC 2023, 27) showed that “as of December 2023, Cambodia's banking system consisted of 58 commercial banks, 9 specialised banks, 4 microfinance deposit-taking institutions, 83 microfinance non-deposit-taking institutions, 114 rural credit institutions, 16 leasing institutions, 6 third-party processors, 33 payment service institutions, 1 credit bureau, 5 representative offices and 2,915 money changers.”

The COVID-19 pandemic accelerated the growth of Cambodia's digital finance landscape, particularly in the domain of payment systems. The expansion of the NBC's Bakong system and KHQR (Khmer QR code) has become central to the country's post-pandemic financial recovery. According to ADB (2019, 7), "the NBC launched the operational phase of Bakong, a key element in the e-commerce infrastructure, and completed the first phase of its enhancement to incorporate a large-value payment system with the functionalities of a real-time gross settlement system (e.g., credit transfer, transaction and information requests, and settlements and statistics reporting)."

2.2.2. Characteristics of Cambodian borrowers and rising concern about NPLs

During the 2000s, Cambodia's financial sector experienced significant reforms aimed at increasing financial inclusion and strengthening the banking system. In fact, the government declared 2006 the "Year of Microfinance," which led to the rapid expansion of MFIs, particularly in rural areas. According to NBC (2006), since the start of the year, several seminars and workshops on microfinance have been organised to enhance the operational efficiency of MFIs, raise public awareness, and broaden access to financial services. The authorities remain fully committed to promoting and strengthening these institutions.

In the 2010s, Cambodia saw substantial progress in financial inclusion due to a growing microfinance sector and improved banking services. By 2013, MFIs accounted for 10 percent of the banking sector's total assets and served approximately 2.4 million customers. According to NBC (2013, iii),

Although poverty fell more than 1 percent, the alleviation of poverty is still a priority of the RGC. Improving the access of both the poor and small and medium enterprises to formal financial services is a principal component of the Government's strategy for reducing poverty. To support this policy, the NBC continued to foster the development of sound MFIs. The total assets of MFIs, which currently serve about 2.4 million customers, rose to about 10 percent of the total assets of the banking sector.

The number of deposit and credit accounts grew significantly as public confidence in financial institutions increased. The *Prakas on Credit Reporting* was passed in May 2011, and Credit Bureau Cambodia (CBC) was officially launched on 19 March 2012 (CBC 2024). The establishment of a credit bureau enhanced credit risk management and transparency, contributing to relatively low NPL ratios.

The 2020s brought transformative changes as digital financial services were adopted and there was a heightened focus on sustainable finance. By 2023, financial inclusion was significantly advanced through platforms such as the Bakong system and KHQR, which facilitated digital payments and e-commerce. Numbers of deposit accounts rose to 18.9 million, and credit accounts reached 3.9 million (NBC 2023, ix). However, the rising number of NPLs became a concern, especially in the post-pandemic period. NBC (2023, ix) found that the NPL ratio rose 5.4 percent and 6.7 percent for the banking and microfinance sectors, respectively, which they attributed to the realisation of loan restructuring measures and slow credit growth. The NBC responded by strengthening regulations to manage credit risks and maintain financial stability.

2.2.3. Effects of microfinance on Cambodia's financial development

Studies on the effects of MFIs on Cambodia's development remain mixed. There are three main schools of thought: positive, negative, and conditional, where the effects vary based on specific

circumstances. Within the positive school of thought, the literature highlights microfinance's significant contributions to financial inclusion, poverty alleviation, and economic development in Cambodia. In fact, IDLO (2008) found that microfinance played a pivotal role in bridging the gap between formal financial services and rural communities, particularly in the post-conflict period. By the early 2000s, microfinance had transitioned from scattered donor-funded initiatives to a structured financial sector underpinned by regulatory frameworks. The rapid expansion of MFIs facilitated economic reconstruction and entrepreneurship, particularly among low-income households. The availability of small loans with high repayment rates enabled micro-entrepreneurs to smooth consumption, invest in productive assets, and improve overall economic resilience. Aiba (2024) further emphasised that despite commercialisation trends, microfinance remains crucial in advancing financial access and supporting sustainable development. However, to prevent mission drift, policymakers must ensure a balance between financial sustainability and social impact through strengthened regulations, particularly by promoting rural outreach and prioritising poverty alleviation.

The sector's positive impact on the country's financial development extends beyond credit provision to fostering financial sector integration and broader economic participation. Roth et al. (2017) found that microfinance significantly improved agricultural productivity and self-employment, particularly among poorer households. Credit access allowed rural farmers to invest in essential inputs such as fertilisers, irrigation, and mechanisation, leading to substantial gains in paddy production and income. The study also found that women disproportionately benefited from microcredit, as it provided opportunities to engage in self-employment activities, improving household financial stability. Green et al. (2023) supported these findings, emphasising that microfinance has deepened financial access for many Cambodian households, creating opportunities for economic mobility. Pimhidzai et al. (2019) further highlighted that microfinance led to a shift from informal moneylenders to formal credit sources, reducing borrowing costs and expanding economic opportunities. The increased participation in microfinance resulted in higher household spending on agriculture and entrepreneurship, contributing to poverty reduction. These findings underscore the role microfinance plays in fostering economic inclusion and financial empowerment, particularly when structured within a sustainable regulatory framework.

The negative school of thought sees microfinance linked to growing financial vulnerabilities despite its positive contributions. Such vulnerabilities include over-indebtedness, aggressive lending practices, and financial distress among borrowers. Bylander (2014) while these loans provide immediate financial relief, they also compel borrowers into cycles of labour migration to meet repayment obligations, exposing them to economic instability and risks of failed migration. Additionally, the lack of comprehensive credit information limits MFIs' ability to accurately assess borrowers' repayment capacities, exacerbating financial distress. The study also pointed out that many loans, originally intended for microenterprise support, are increasingly used to fund migration-related expenses, further diverting microfinance away from its initial poverty-alleviation mission. Seng (2018) illustrated the risks associated with loan misallocation and unsustainable debt burdens. While microcredit has enabled some households to invest in income-generating activities, a substantial proportion of borrowers rely on loans for non-productive expenses, such as daily consumption and emergencies. High-interest rates and excessive loan amounts relative to income have plunged many borrowers into cycles of debt, often requiring them to take out additional informal loans to meet repayment obligations. Guermond et al. (2022) extended this critique by highlighting the commodification of rural livelihoods. Many Cambodian farmers rely on microloans for climate adaptation and agricultural inputs. However, the rising costs of farming and lack of state support have forced

them into unsustainable debt cycles. By 2021, the average microfinance loan size exceeded Cambodia's GDP per capita, placing severe financial strain on rural households.

Green et al. (2023) found that microfinance's increasing commercialisation has deepened socio-economic vulnerabilities, often prioritising financial performance over social impact. Their study highlighted the prevalence of "debt juggling," where borrowers manage repayments by taking additional loans, often from high-interest informal lenders. This pattern is exacerbated by strict repayment schedules and the use of land-based collateral, which has led to land dispossession and worsening financial insecurity. Bateman (2024) the role of land tenure soon attracted the attention of the international development community as a neoliberal-oriented theory of change rooted in the possession and use of private individual land titles by the poor. One of the central mechanisms proposed by de Soto was a three-step process that involves the poor (1 reinforced this critique, arguing that Cambodia's microfinance model has prioritised profit maximisation over poverty alleviation. The widespread reliance on land titles as collateral has led to aggressive lending and forced asset sales, placing borrowers at heightened risk of financial loss. While the sector was initially designed to empower small entrepreneurs, its shift toward commercialisation has compromised its original mission and has raised urgent questions about the long-term sustainability of microfinance as a development tool.

Finally, the mixed school of thought sees the impact of microfinance in Cambodia as highly context-dependent, with its benefits and obstacles varying based on borrower circumstances and the regulatory environment. Chhorn (2019) found that while microfinance has contributed to poverty reduction, particularly in structured development programs, its broader welfare impact remains insignificant. While access to microcredit has improved household income levels, particularly for those engaged in agricultural cooperatives, systemic issues—high interest rates, non-productive use of loans, over-indebtedness, often landless customers, and intergenerational migration—have offset many potential benefits. Additionally, the rapid commercialisation of MFIs has created concerns about mission drift, where profit-driven lending practices overshadow social objectives. The introduction of an 18 percent interest rate cap on microfinance loans in 2017 exemplifies these policy dilemmas. While the cap reduced borrowing costs for some, it also restricted access to smaller loans, thereby pushing some borrowers back toward informal moneylenders. Bliss (2022) further underscored this duality by highlighting both the transformative and exploitative dimensions of microfinance. On the one hand, expanded credit access has enabled rural households to invest in small businesses, agriculture, and housing improvements, driving economic growth. On the other hand, the aggressive lending practices of some MFIs, particularly those reliant on land as collateral, have placed borrowers at risk of losing their most valuable assets. Over-indebtedness remains a pressing concern. In fact, many borrowers prioritise loan repayments over essential household expenditures, leading to reduced food security and limited spending on healthcare and education. Despite high repayment rates, the human cost of these repayments, including forced land sales and labour migration, raises ethical and policy questions about the true effectiveness of microfinance as a poverty alleviation tool.

The broader implications of microfinance's mixed impact suggest that targeted reforms are necessary to maximise benefits while mitigating risks. Pimhidzai et al. (2019) recommended a combination of financial literacy programs, consumer protection mechanisms, and digital financial innovations to improve microfinance's effectiveness. The transition from informal to formal credit sources has been a major achievement, but it has also introduced new risks, such as rising debt-to-income ratios and financial exclusion due to regulatory constraints. In this regard, the development of an independent financial information provider, such as the

Credit Bureau of Cambodia (CBC), has played an important role in addressing information asymmetry. For instance, they have provided credit reporting services that allow lenders to assess borrower risk more accurately and thus reduce the likelihood of over-indebtedness and promote financial stability. In addition, ensuring that microfinance remains an inclusive and sustainable development tool requires balancing financial sector growth with social objectives. Strengthening borrower protections, introducing flexible repayment structures, and promoting diversified financial instruments beyond credit alone can help ensure that microfinance fulfils its potential as a tool for equitable economic growth rather than a driver of financial distress.

2.3. MFIs transitioning to banks and its implications

In recent years, Cambodia's financial sector has undergone significant transformations. Notably among these changes has been the transition of many MFIs into commercial banks. While this transition is still in its early stages, there has been a noticeable increase in such developments during the post-pandemic period, highlighting differences between the pre- and post-pandemic periods. The forces driving this transition can be attributed to various factors: economic profitability and market influences.

Several MFIs have transitioned to banks in the past 15 years, and we present a few examples of such transitions here. In 2012, Sathapana Microfinance Plc, one of the largest MFIs in Cambodia, transformed into a commercial bank. This move followed the acquisition of a 95.1 percent stake by Japanese-owned Maruhan Bank. Sathapana became the second MFI to make this transition, following ACLEDA in 2009 (May 2016). Subsequently, in 2020, two more financial institutions transitioned into commercial banks. Ly Hour Microfinance Institution became SBI LY HOUR Bank, a joint venture between Ly Hour Microfinance Institution and SBI Holdings Inc. Similarly, Hattha Kaksekar Limited, a former MFI, successfully transitioned into Hattha Bank Plc in August 2020, following its acquisition by Bank of Ayudhya (Krungsri), a Thai commercial bank. In 2023, Prasac MFI Plc, Cambodia's largest MFI, also became a commercial bank after its complete acquisition by KB Kookmin, one of South Korea's top five largest banks, for an accumulated sum of USD1 billion. The new entity, known as KB Prasac Bank Plc, is a merger between Prasac, which had nearly USD4.8 billion in assets as of 31 December 2022, and Kookmin Bank Cambodia Plc (Amarthalingam 2023). In May 2024, Bank SinoPac announced its plans to acquire Amret Plc, one of the leading financial institutions in Cambodia. This acquisition is expected to enable Bank SinoPac to extend its overseas network and exert more positive influence on sustainable finance. As of 31 December 2023, Amret had 150 operating branches in 24 provinces across Cambodia, with total assets of approximately USD2 billion. Bank SinoPac will acquire 80 percent of the equity of Amret in the first tranche for approximately USD435 million, followed by two further tranches of 10 percent each, at the end of the first year and second year, respectively (Sinopac 2024).

As MFIs transitioned into commercial banks, they also influenced a sector heavily reliant on foreign capital, which, in turn, has impacted the development of the country's financial sector. Aiba (2024) emphasised that recent developments in the microfinance sector have attracted significant capital investment. Concurrently, there has been an increase in the number of MFIs acquired by domestic and foreign private investors, particularly commercial banks. The study found that these acquisitions have contributed to increases in the loan portfolios of MFIs and a shift in their credit allocation from rural to urban areas. Thus, changes in ownership and organisational structures through acquisitions by commercial investors could potentially cause mission drift among MFIs. Aiba (2023, 5) also explained:

In the Cambodian banking sector, foreign-owned banks are also allowed to operate, as there are no restrictions on foreign ownership of a subsidiary, a branch, or a representative office. Subsidiaries and branches are permitted to engage in full banking activities. For subsidiaries, a foreign owner could have 100 percent of its shares, and could acquire the shares of an existing local bank. There is no difference in prudential regulation between locally-owned banks and foreign-owned banks.

The nature and characteristics of MFIs and banks differ in terms of loan sizes, capital structures, regulatory requirements, and service offerings. Aiba (2023, 5) emphasised:

The Cambodian banking sector is composed of three types of financial institutions: commercial banks, specialized banks, and MFIs which include both Microfinance Deposit-Taking Institutions (MDIs) and non-deposit-taking MFIs. Commercial banks are allowed to provide all financial services, while the regulations governing them are most strict in terms of capital and reserve requirements. Specialized banks can be engaged in only one type of financial service, such as settlement network or loan provision to the agricultural sector as well as to MSMEs. MFIs are aimed at providing financial services for the poor, with restrictions on the amount of each loan grant, but are not permitted to take deposits from customers. On the other hand, MDIs are permitted to take deposits from customers and thus offer broader services such as accepting deposits, providing savings accounts and offering microloans. As of 2017, commercial banks dominate almost 85 percent of total assets in the Cambodian banking sector, while MFIs cover the remaining 15 percent. Specialized banks have less than 1 percent of total assets in the entire banking sector.

However, the roles of MFIs and banks in Cambodia are likely mixed because of the evolution of loan sizes and resulting loan restructuring, in addition to the rising number of borrowers. Additionally, the loan sizes of some MFI borrowers are comparable to those of commercial and specialised banks. Aiba (2024) suggested that acquisition cases have led to increases in loan portfolios of MFIs, both in terms of loan amounts and the number of borrowers. This supports the claim that loan size evolution and restructuring have impacted the roles MFIs and banks play in Cambodia's financial sector. According to Aiba (2024, 1), "the acquisition cases have contributed to increases in the loan portfolios of MFIs and a shift in MFIs' credit allocation from rural to urban areas after acquisition. Thus, changes in ownership and organizational structures through acquisition by commercial investors could more or less cause mission drift among MFIs."

The positive implications of MFIs transitioning to banks are centred around increased efficiency, larger economies of scale, larger firm size, higher banking concentration, and improved performance in response to external shocks (see Allen and Liu 2007; Baltensperger 1972; Bárcenas, Barreiro, and Pagliacci 2016; Benston 1972; Kolari and Zardkoohi 1991; Mitchell and Onvural 1996; and Shaffer and David 1991). The role of financial institutions in mitigating external shocks has been explored in studies across the world. In their study of how Latin American banks of varying sizes respond to financial turbulence, Bárcenas, Barreiro, and Pagliacci (2016) found that larger banks maintain deposits and even improve profitability during adverse shocks, though this increase largely comes from non-lending activities rather than traditional lending. Despite a temporary drop in operating efficiency and a reduction in lending, large banks benefit from local currency depreciation in their investment strategies. However, this profitability boost does not necessarily lead to greater financial stability; instead, large banks accumulate more liquid assets and shift resources towards mortgage credit.

In addition, commercial banks that emerged from MFIs can play a pivotal role in strengthening the financial sector by increasing credit availability, reducing dependence on foreign capital,

and fostering domestic investments in critical sectors. Mitchell and Onvural's (1996) study "Economies of Scale and Scope at Large Commercial Banks" analysed cost efficiency in large commercial banks using a Fourier flexible cost function, encompassing the translog form as a subset. Their findings provided limited evidence of economies of scale and scope in large banks. In addition, in their analysis of US commercial banks during 1981, 1983, and 1985, Kolari and Zardkoohi (1991) observed that evidence is found that cost curves were downward sloping in these years. Moreover, the largest banks tended to have the greatest scale economies, implying that large banks have an operating cost advantage over smaller banks. Similarly, Shaffer and David (1991) suggested that there may be cost incentives or benefits associated with expansion or consolidation among large regional banks, including interstate operations.

While transitioning MFIs to banks offers significant opportunities for enhancing the financial sector, it is not without risks. One major concern is the potential dilution of MFIs' original mission to serve low-income and rural populations. In fact, studies such as Simper (1999) and Hermes, Lensink, and Meesters (2011) suggested that the commercialisation of microfinance may lead to mission drift, where institutions prioritise profitability over social objectives, potentially leaving vulnerable groups underserved. This could exacerbate financial exclusion for the very populations MFIs were designed to support. Another critical risk is the increased regulatory burden on institutions undergoing this transition, especially since commercial banks are subject to stricter regulatory and capital requirements than MFIs. As highlighted by Cull, Demirgüç-Kunt, and Morduch (2009), the compliance costs and operational complexities of becoming a commercial bank can strain the capacity of smaller MFIs, leading to operational inefficiencies or even failure.

3. Methodology and data

3.1. Data

To build the panel dataset, we compiled reports on microfinance from the NBC between 2013 and 2021. Annexe A1 lists the information available in these reports. We then structured the data into a panel format with yearly observations for each institution. Next, we identified financial institutions that transitioned to commercial or specialised banks by consulting their websites and relevant news articles. The transitioned MFIs' data are recorded under the microfinance category up until their final year as MFIs. From the year of transition onward, each MFI's information is included in the bank category. To capture the full timeline, we continued to extract reports for these institutions under the bank category after their transition. Finally, we linked the two datasets to create a comprehensive panel that includes MFIs that have not transitioned, those that have not yet transitioned, and those up to and including their transition to banks.

To further enrich the dataset, we incorporated time-fixed macroeconomic variables, such as the GDP growth rate (sourced from the National Institute of Statistics), the lending rate (sourced from the International Financial Statistics - IFS), and the WUI.

The final dataset comprises an unbalanced panel of 806 observations between 2013 and 2023 that covers 120 distinct institutions (see Annexe A2).

3.2. Model specification

To analyse the main effects of the MFIs' transition and the impact of global uncertainty from geopolitical economic fragmentation on the financial inclusion and financial risk, we specify two regression models:

$$\text{Log loan}_{it} = \alpha + \beta \text{Log loan}_{it-1} + \gamma \text{Post transition}_{it} + \delta \text{Log WUI}_t + \mu Z_{it} + y_t + \varphi_i + \mu_{it} \quad (1)$$

$$\text{NPL ratio}_{it} = \alpha + \beta \text{NPL ratio}_{it-1} + \gamma \text{Post transition}_{it} + \delta \text{Log WUI}_t + \mu Z_{it} + y_t + \varphi_i + \mu_{it} \quad (2)$$

The two model specifications have the following variables:

- Log loan_{it} are NPL ratio_{it} the outcome variables which are used to proxy respectively the financial inclusion and the financial risk, the focus of our analysis.
- Log loan_{it-1} and NPL ratio_{it-1} are the lagged outcome variables and are included as regressors to account for their persistence effects due to financial indicator nature.
- $\text{Post transition}_{it}$ is the dummy variable equal to 1 if an institution has transitioned to bank in year t and 0 otherwise.
- Log WUI_t is the logarithm of world uncertainty index in year t .
- Z_{it} are the control variables. They include variables such as net profit as a percentage of assets, equity-asset ratio and log of asset.
- φ_i is the institution-fixed effect of controlling unobserved cross-institution heterogeneity.
- y_t are the time-fixed effect variables. They include GDP growth rate and lending rates (macroeconomic factors) and year dummy variables.
- ε_{it} : Error term representing unobserved factors.

In addition to analysing the main effects of MFIs' transition and global geoeconomic fragmentation, we also aimed to examine the interaction between these two factors and their impact on financial inclusion and financial risk. Therefore, we introduced two additional model specifications as follows:

$$\text{NPL ratio}_{it} = \alpha + \beta \text{NPL ratio}_{it-1} + \zeta \text{Post transition}_{it} * \text{Log WUI}_{it} + \mu Z_{it} + y_t + \varphi_i + \mu_{it} \quad (3)$$

$$\text{Log loan}_{it} = \alpha + \beta \text{Log loan}_{it-1} + \zeta \text{Post transition}_{it} * \text{Log WUI}_{it} + \mu Z_{it} + y_t + \varphi_i + \mu_{it} \quad (4)$$

We then proceeded with a correlation test between the regressors and found evidence of high collinearity among some of them (see Annexe A3). In particular, we found the log of assets to be highly correlated with the equity-to-asset ratio, while some year dummy variables exhibited high correlation with macroeconomic variables such as the GDP growth rate. Consequently, the log of assets and the year dummy variables were dropped from the model. Annexe A4 describes the variables used and their sources. Our final model specifications for the main effects and interaction effects for both outcome variables were as follows:

$$\begin{aligned} \text{NPL ratio}_{it} = & \alpha + \beta \text{NPL ratio}_{it-1} + \gamma \text{Post transition}_{it} + \delta \text{Log WUI}_{it} + \theta \text{Equity asset ratio}_{it} \\ & + \vartheta \text{Net profit as percentage of asset}_{it} + \iota \text{Economic growth}_t + \kappa \text{Lending rate}_t + \varphi_i + \mu_{it} \end{aligned} \quad (5)$$

$$\begin{aligned} \text{Log loan}_{it} = & \alpha + \beta \text{Log loan}_{it-1} + \gamma \text{Post transition}_{it} + \delta \text{Log WUI}_{it} + \theta \text{Equity asset ratio}_{it} \\ & + \vartheta \text{Net profit as percentage of asset}_{it} + \iota \text{Economic growth}_t + \kappa \text{Lending rate}_t + \varphi_i + \mu_{it} \end{aligned} \quad (6)$$

$$\begin{aligned} \text{NPL ratio}_{it} = & \alpha + \beta \text{NPL ratio}_{it-1} + \zeta \text{Post transition}_{it} * \text{Log WUI}_{it} + \theta \text{Equity asset ratio}_{it} \\ & + \vartheta \text{Net profit as percentage of asset}_{it} + \iota \text{Economic growth}_t + \kappa \text{Lending rate}_t + \varphi_i + \mu_{it} \end{aligned} \quad (7)$$

$$\begin{aligned} \text{Log loan}_{it} = & \alpha + \beta \text{Log loan}_{it-1} + \zeta \text{Post transition}_{it} * \text{Log WUI}_{it} + \theta \text{Equity asset ratio}_{it} \\ & + \vartheta \text{Net profit as percentage of asset}_{it} + \iota \text{Economic growth}_t + \kappa \text{Lending rate}_t + \varphi_i + \mu_{it} \end{aligned} \quad (8)$$

3.3. Estimation strategy

In this section, we explain and demonstrate the application of different panel data estimation techniques to assess the robustness of the results. For simplicity, we refer to our model based on the simple specification below:

$$y_{it} = \alpha + \beta y_{it-1} + \gamma X_{it} + z_t + \varphi_i + \mu_{it} \text{ or } (9)$$

$$y_{it} = \alpha + \beta y_{it-1} + \gamma X_{it} + z_t + \varepsilon_{it} \text{ (10)}$$

Where y_{it} is the outcome variables (the NPL loan ratio and the log of loan of the financial institution), X_{it} is a vector of explanatory variable, z_t is the time-specific effect that captures shocks; and ε_{it} is the error term composed of φ_i , time-invariant institution-specific fixed effects, and μ_{it} which is considered to be independent and evenly distributed with zero mean and constant variance.

The dynamic panel model violated the orthogonality condition as the lagged dependent variable (y_{it-1}) depending on ε_{it-1} , which is a function of ε_{it} . As a result, it caused bias in dynamic, panel data estimation, which only goes away as t tends to infinity.

To remove the institution fixed effect, we deducted from the equation to get:

$$\Delta y_{it} = \beta \Delta y_{it-1} + \gamma \Delta X_{it} + \Delta z_t + \Delta \mu_{it} \text{ (11)}$$

As Δy_{it-1} includes μ_{it-1} , a component of $\Delta \mu_{it}$, then the pooled Ordinary least squares (OLS) estimator would yield a biased result as Δy_{it-1} correlates with $\Delta \mu_{it}$.

To circumvent this problem, the difference Generalized Method of Moments (GMM) estimator was developed by assuming that the error terms were serially uncorrelated in Equation (9). The level of y_{it} lagged two periods or more can be used as valid instruments for Equation (11). This is because $y_{i(t-2t)}$ and earlier values are correlated with $\Delta y_{i(t-t)}$, but not with $\Delta \mu_{it}$. Assuming that the X_{it} are predetermined in the sense that X_{it} and μ_{it} are uncorrelated, but X_{it} may be correlated with μ_{it-1} and earlier errors, x_{it} lagged one period or more are also used as valid instruments. Thus, the accompanying moment conditions are:

$$E[y_i(t-2t) \Delta \mu_{it}] = 0 \text{ for } t = 1, 2, 3..T$$

$$E[x_i(t-t) \Delta \mu_{it}] = 0 \text{ for } t = 1, 2, 3..T$$

However, other studies have found the two-step estimator to be downwardly biased when applied to situations with a small sample over time. To overcome these limitations, the system GMM estimator was developed by using lagged first differences as instrumental variables to combine first-difference and level regressions. The system estimator addressed the issue of weak instruments by employing a more robust set of instrumental variables, resulting in greater efficiency.

To derive these additional conditions, we assumed that the panel effect is not correlated with the initial observable difference in the dependent variable. We expressed these additional moment conditions as follows:

$$E[\Delta y_i(t-t) \mu_{it}] = 0 \text{ for } t = 1, 2, 3..T$$

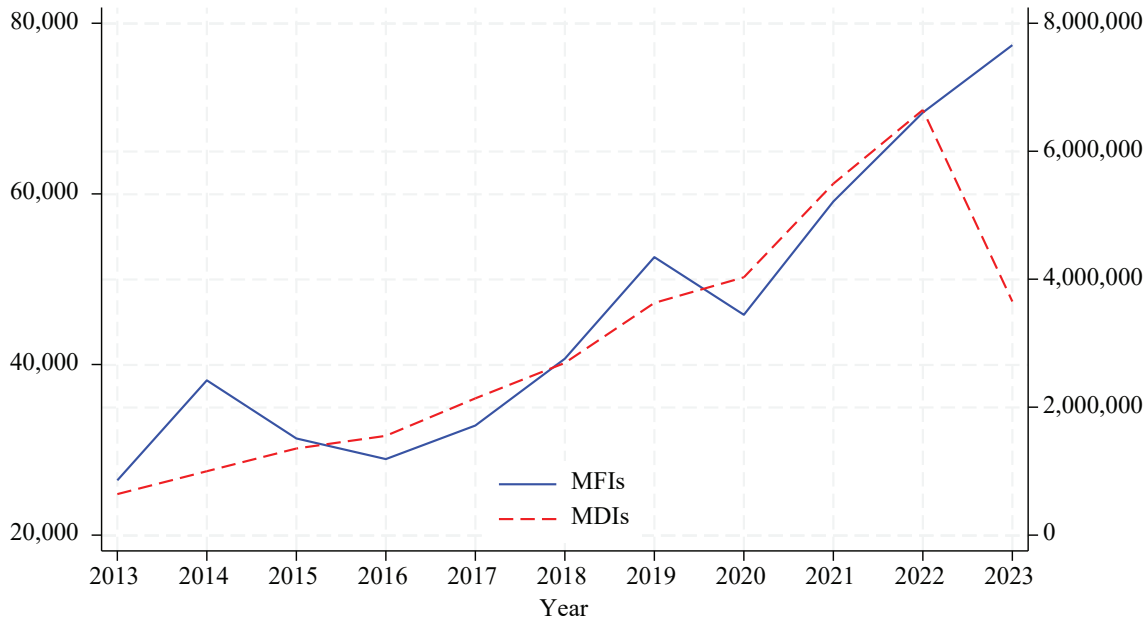
$$E[\Delta x_i(t-t) \mu_{it}] = 0 \text{ for } t = 1, 2, 3..T$$

While the GMM estimator is effective in addressing endogeneity in dynamic panel models, its effectiveness depends heavily on instrument validity, sample size, and model specification. Therefore, robust tests are crucial for evaluating the consistency of the GMM estimator. The first test is the Sargan test of overidentifying restrictions, which assesses the validity of the instruments used in the model. If the null hypothesis is not rejected, it indicates that the instruments are valid and that the model is correctly specified. The second test is the Arellano-Bond test for residual serial correlation. For first-order serial correlation (AR1), the null hypothesis should be rejected, confirming its presence. However, for second-order serial correlation (AR2), the null hypothesis should not be rejected, confirming its absence.

3.4. Observing variables’ trending

The data from 2013 to 2023 on various aspects of Cambodia’s microfinance sector revealed important trends and insights into the sector’s growth, challenges, and transformation. Overall, Cambodia’s microfinance sector has experienced significant growth driven by rising demand for financial inclusion. However, the sector also faces challenges proxied by rising NPLs amid the geoeconomic fragmentation. Some MFIs’ transition to banks reflected a maturing financial landscape with an increasing appeal for foreign investors. The increased NPL ratios observed in prior analyses further underscore the sector’s exposure to borrower defaults, economic volatility, and regulatory impacts. This financial strain is likely to continue impacting profitability and operational stability. Moving forward, the sector’s resilience will depend on effective risk management, improved regulatory compliance, and strategic adjustments to navigate profitability challenges and maintain stability.

Figure 1: Loans provided by MFIs and MDIs, 2013 to 2023



Source: Authors’ elaboration.
 Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions.

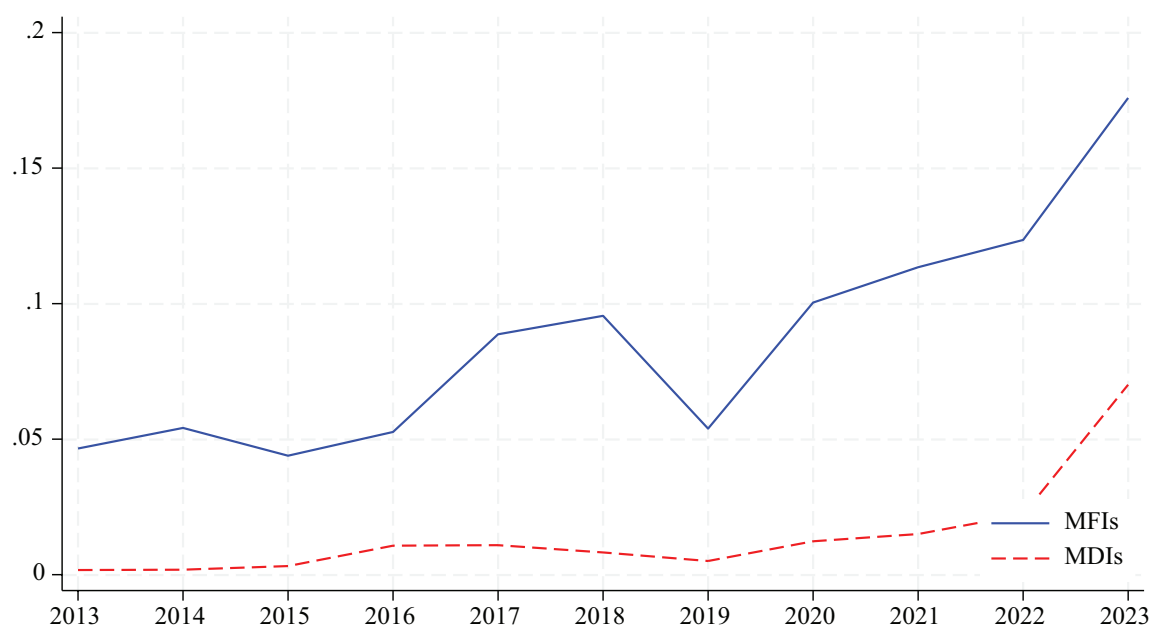
A. Cambodia’s financial development inclusion and stability

Figure 1 illustrates the trends in the mean of loans provided by MFIs and the microfinance MDIs in Cambodia between 2013 and 2023. From 2013 to 2016, both MFIs and MDIs showed relatively moderate growth in their loan averages. However, between 2017 and 2021, the mean loan amounts for MFIs grew more rapidly, particularly after 2019. MDIs also displayed growth, though at a slightly slower rate than that of MFIs. The trend suggests that MFIs’ lending

capabilities strengthened over this period, possibly due to increased financial inclusion, widened operational capacities, or a rise in small loan demand. In 2022, both MFIs and MDIs reached their highest recorded loan means. Yet, in 2023, MDI loans declined sharply, which may have been driven by the transformation of one MDI into a commercial bank. MFIs continued their growth trend that same year.

Figure 2 illustrates the NPL ratio for MDIs and MFIs in Cambodia from 2013 to 2023. The NPL ratio for MFIs shows significant fluctuation over the period, with a notable increase from 2019 to 2023 and peaking in 2023. After a brief decline in 2019, the ratio began to rise again from 2020 onward. By 2023, the MFIs' NPL ratio had reached its highest point. This upward trend indicates growing challenges in loan performance within the MFI sector. Such challenges are likely due to economic slow-down factors that may have impacted borrowers' ability to repay their loans. The sharp increase in NPLs after 2020 suggests that MFIs have become increasingly vulnerable, potentially due to their exposure to higher-risk borrowers or the economic impact of the COVID-19 pandemic and other shocks. By contrast, MDIs have maintained relatively low and stable NPL ratios throughout the observed period, especially between 2013 and 2019 when the ratio remained close to 1 percent. However, MDIs' NPL ratios gradually rose from 2020 onward, reaching over 5 percent in 2023. Although the NPL ratio for MDIs remains significantly lower than that of MFIs, the steady increase suggests that MDIs are also feeling the effects of broader economic pressures. Their relatively slower rise in NPL ratios compared to MFIs might indicate that MDIs are better equipped to manage risk or provide to a less vulnerable borrower base.

Figure 2: NPL loan ratio in Cambodia, 2013 to 2023



Source: Authors' elaboration.

Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions.

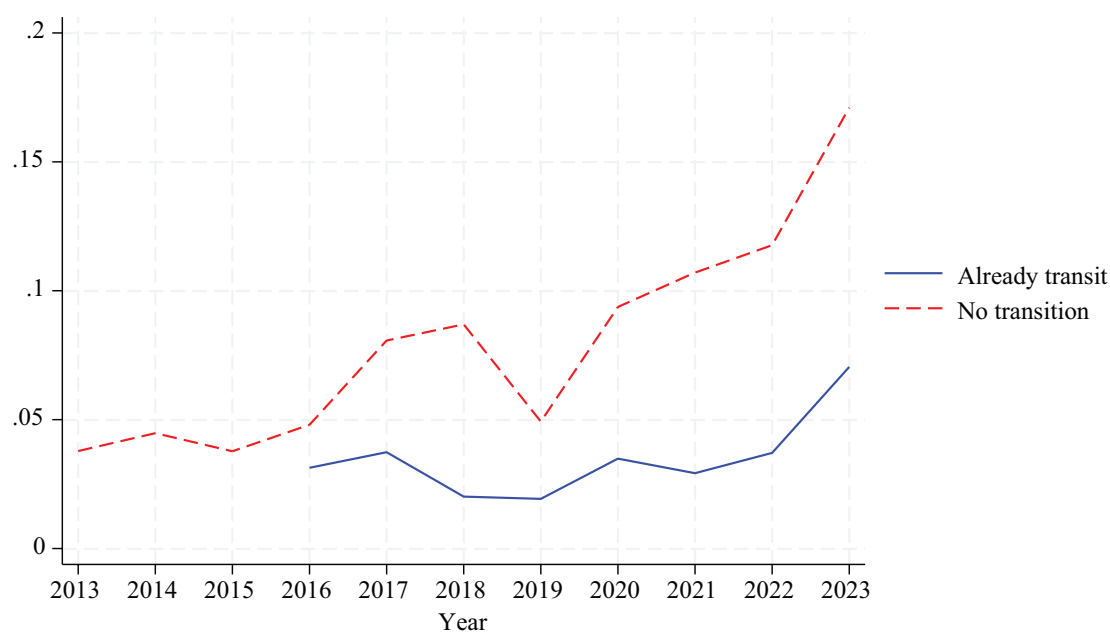
The upward trend in NPL ratios for both MFIs and MDIs after 2020 points to systemic pressures on Cambodia's microfinance sector. This trend likely reflects macroeconomic challenges such as slower economic growth, inflation, and increasing household debt burdens, all of which have strained borrowers' ability to meet their loan obligations. The steep rise in NPLs for MFIs may indicate that this segment of the financial sector is more exposed to risk. On the other hand, with only four institutions in 2023, MDIs seem to have more robust risk management

practices, though they are by no means immune to broader economic pressures. These trends highlight the need for careful monitoring and potential policy intervention to prevent further deterioration in the financial health of the microfinance sector.

Figure 3 presents the average NPL ratio in Cambodia between 2013 and 2023 by comparing two categories of MFIs: *already transitioning* (MFIs that have transitioned to banks in the referenced year) and *no transition* (MFIs that have not undergone the transition in the referenced year). The analysis revealed important trends across these categories. First, MFIs that had not transitioned to banks showed the highest and most volatile average NPL ratios over the period. The NPL ratio for this group began to increase notably after 2016. The upward trend accelerated after 2020, peaking sharply in 2023 at over 15 percent. Such a sharp increase indicates severe deterioration in loan performance. This may reflect structural weaknesses in MFIs that have not transitioned, as they likely face higher exposure to credit risks or borrower defaults, especially in the wake of external economic shocks like the COVID-19 pandemic.

Second, the MFIs that had already transitioned to banks exhibited a more stable movement in the NPL ratio. Before 2022, the NPL ratio remained low, below 5 percent. By 2023, the NPL ratio for this group reached above 5 percent. Although the ratio was still lower than the *no transition* group, it is still indicative of rising challenges. This suggests that while transitioning to banks might offer some protection against severe credit risks, it does not entirely shield these institutions from broader economic pressures affecting borrowers.

Figure 3: Average NPL loan ratio in Cambodia, 2013 to 2023



Source: Authors' elaboration.

The sharp rise in NPL ratios post-2020, particularly for MFIs that had not transitioned to banks, underscores the heightened vulnerability of these institutions to economic challenges, which were likely exacerbated by the COVID-19 pandemic and other financial pressures. MFIs that have already transitioned to banks show a somewhat mitigated risk, as reflected in their lower NPL ratios compared to the non-transitioned group. However, the continuous rise in NPLs even for these transitioned institutions suggests that economic shocks affect all segments of the financial sector, albeit to varying degrees.

B. Transition from MFIs to banks in Cambodia

Figure 4: Number of MDIs, MFIs and the transitioned banks in Cambodia, 2013 to 2023

Year	MDIs	MFIs	CB	SB
2013	7	29	0	0
2014	7	32	0	0
2015	8	45	0	0
2016	7	62	2	1
2017	7	69	2	1
2018	7	73	3	1
2019	7	75	3	1
2020	6	73	5	1
2021	5	72	6	1
2022	5	82	6	1
2023	4	83	7	1

Source: Authors' elaboration.

Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions; CB = Commercial Banks; SB = Specialized Banks.

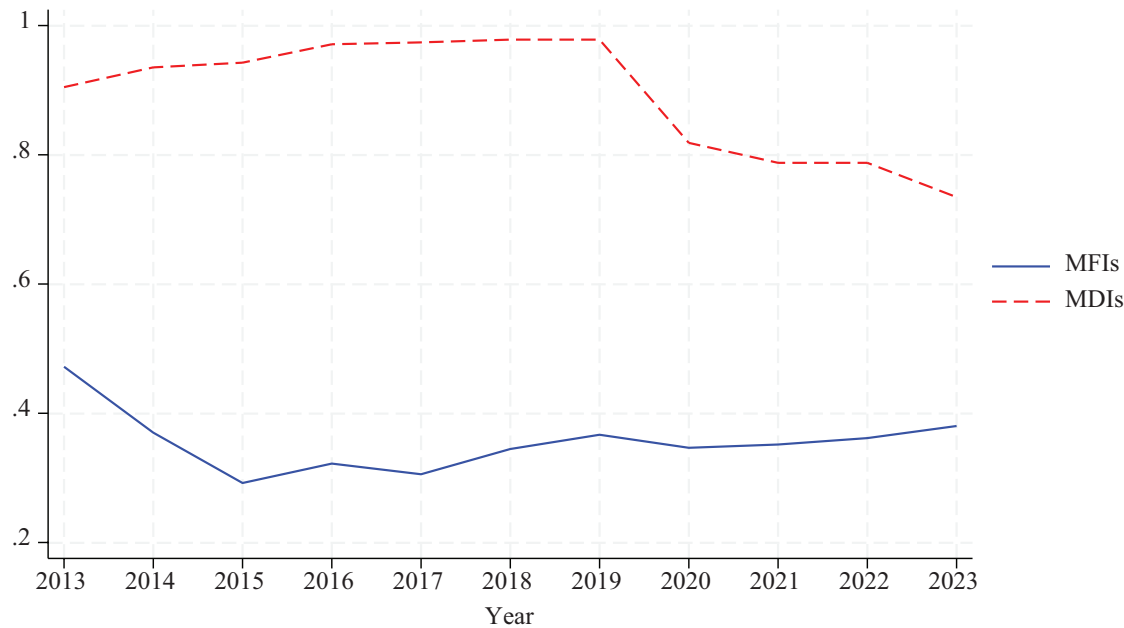
Figure 4 illustrates the number of MDIs, MFIs, and the transitioned banks in Cambodia from 2013 to 2023. In 2013, there were 7 MDIs and only 29 MFIs. The number of MDIs remained fairly stable between 2013 and 2020, fluctuating between 6 and 8 institutions annually. However, starting in 2020, the number of MDIs noticeably declined, dropping to just 4 institutions by 2023. This downward trend suggests consolidation within the sector, driven by MDIs transitioning into banks and specialised banks. Between 2013 and 2023, there were a total of 8 transition cases, 7 of which involved MFIs/MDIs transitioning into banks, while 1 involved an MFIs/MDIs transitioning into a specialised bank. This growth reflects a maturing financial sector in Cambodia, where some MFIs and MDIs have successfully transitioned into banks. This trend signals the development of a more regulated and stable banking environment as institutions scale up to meet broader financial needs in the country. On the other hand, MFIs have seen steady growth over this same period, increasing from 29 institutions in 2013 to 83 in 2023. The consistent rise of MFIs, particularly after 2016, highlights the growing demand for microfinance services in Cambodia, especially in underserved regions. However, this rapid expansion could also pose risks since it may lead to challenges in maintaining loan quality and institutional stability, as evidenced by rising NPL ratios in the sector.

Figure 5 presents the foreign share of ownership in MDIs and MFIs in Cambodia from 2013 to 2023. The foreign share refers to the proportion of foreign ownership or investment in these institutions over time. Two distinct trends are observable for MDIs and MFIs. For MDIs, the foreign share remained consistently high, hovering around 80-85 percent between 2013 and 2022. This consistently high foreign share indicates the dominant presence of foreign ownership in this segment. Furthermore, such stability suggests that foreign investors have maintained a strong interest in MDIs, which likely reflects the perception of MDIs as relatively stable, regulated, and attractive investment opportunities within Cambodia's financial sector.

However, between 2020 and 2023, the foreign share in MDIs declined noticeably, dropping to approximately 73 percent in 2023. Though this drop may reflect the effect of the transformation of two MDIs into commercial banks during this period and not be a significantly negative

indicator. In contrast, the foreign share in MFIs showed a slight upward trajectory. Starting at approximately 30 percent in 2015, the foreign share steadily increased over the years, reaching 36 percent in 2019. This upward trend reflects growing foreign interest and investment in the MFI sector, likely driven by the expanding microfinance market in Cambodia and the potential for high returns in a developing economy. However, since 2020, the foreign share in MFIs stabilised, remaining below 40 percent through 2023. The stabilisation of foreign investment in MFIs might suggest that the market is reaching a saturation point or that investors are becoming more cautious, possibly due to concerns over rising NPLs or regulatory risks within the sector.

Figure 5: Foreign share, 2016 to 2023

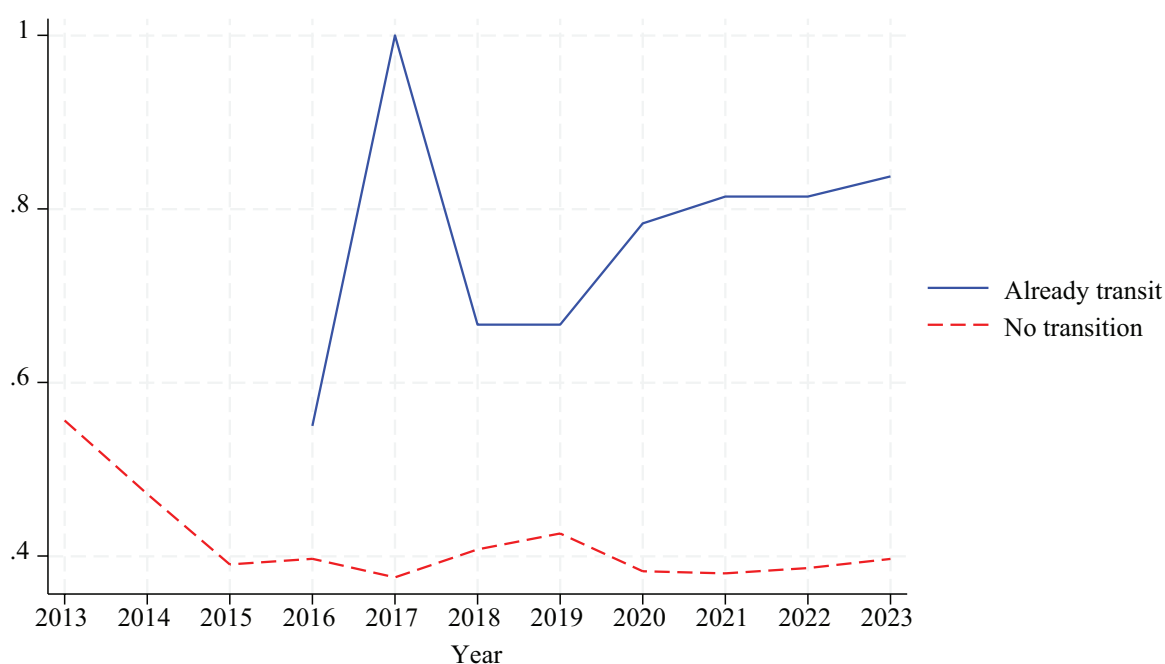


Source: Authors’ elaboration.
 Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions.

Figure 6 displays the average foreign share of ownership in two categories of MFIs (those that transitioned to banks and those that did not transit) between 2013 and 2023. First, MFIs that transitioned to banks have a much higher share of foreign ownership compared to those that did not. Since 2017, the majority of these transitioned MFIs have been owned by foreign investors, with foreign ownership consistently above 60 percent. By 2021, this share stabilised at around 80 percent, demonstrating a strong and steady reliance on foreign backing. For non-transitioned MFIs, the level of foreign ownership is lower but still significant. While the level of foreign ownership is more moderate, it has remained steady over time, reaching an average of about 40 percent by 2023.

This data highlights an important insight: financial institutions in Cambodia are heavily reliant on foreign ownership and capital inflows, regardless of whether they have transitioned to banks or not. This may also reveal a broader macroeconomic trend that the banking industry has become a key player in attracting international capital, possibly due to strong macroeconomic stability and regulatory frameworks that favour foreign investment. The difference may lie in the degree of dependence, with transitioned MFIs relying even more on foreign investments to sustain their operations.

Figure 6: Average foreign share, 2013 to 2023

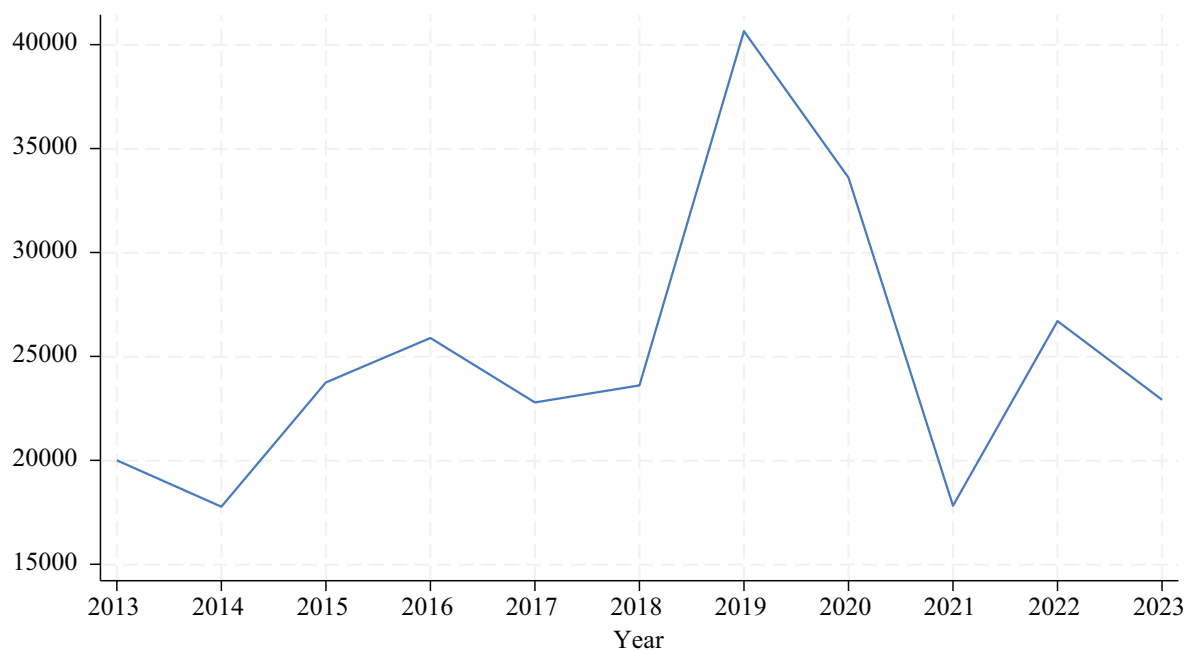


Source: Authors' elaboration.

Figure 7 shows the WUI from 2013 to 2023, representing fluctuations in global uncertainty over the period. The WUI appears to vary significantly, with peaks around specific years, which may reflect global events that heightened economic and political uncertainty.

C. Global economic fragmentation

Figure 7: Global World Uncertainty Index, 2013 to 2023



Source: Authors' elaboration.

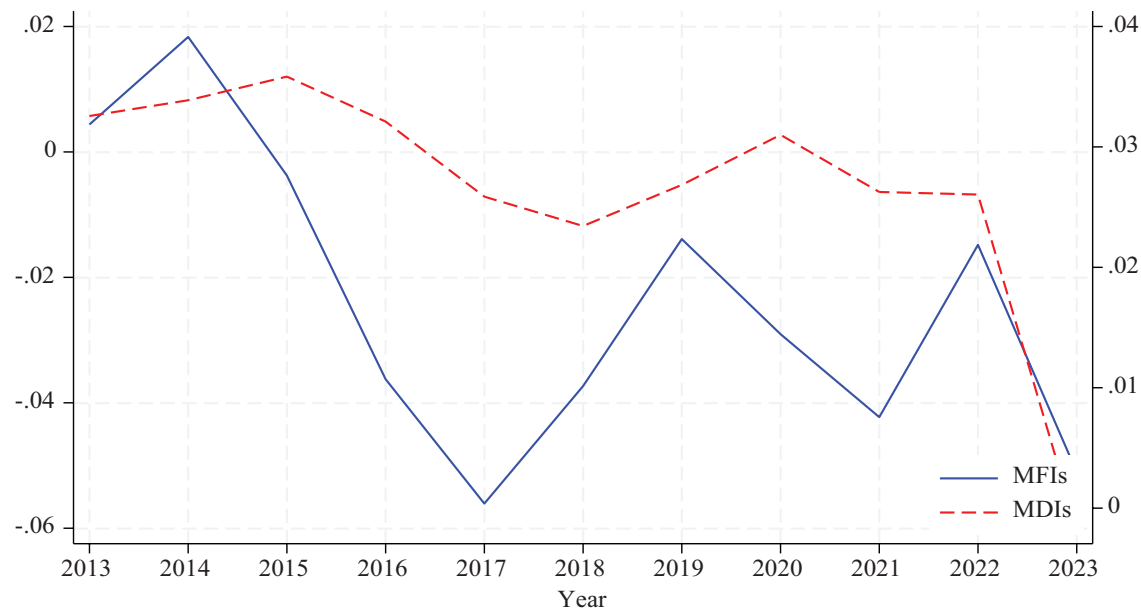
From 2013 to 2015, the index was relatively stable with values fluctuating between 20,000 and 25,000. A gradual increase followed with notable peaks in 2019 when the index reached its highest level at around 40,000. This peak likely corresponds to the COVID-19 pandemic, which caused unprecedented uncertainty in global markets. After 2020, the index declined somewhat but remained above pre-2019 levels, suggesting that the residual effects of the pandemic, alongside other geopolitical and economic issues, continued to contribute to heightened uncertainty.

High global uncertainty, as indicated by peaks in the WUI, likely has significant implications for Cambodia’s financial development. Cambodia is an open, developing economy, and fluctuations in global uncertainty can impact it through various channels, such as investment flows and FDI. In summary, heightened levels of global uncertainty, as depicted by the WUI, may slow Cambodia’s financial development through reduced investments, credit constraints, and economic volatility. Managing these impacts requires strategic planning and policy adjustments to bolster resilience against external shocks.

D. Institutional financial variables

Figure 8 illustrates the net profit as a share of assets for MDIs and MFIs in Cambodia between 2016 and 2023. This metric reflects the profitability of each type of institution relative to their total assets and provides insight into the financial efficiency and profitability trends within the microfinance sector. For MDIs, the net profit as a share of assets was initially high in 2016 at over 3 percent, indicating strong profitability relative to their asset base. However, after this initial peak, the ratio slightly declined, stabilising between 2.5 percent and 3 percent between 2017 and 2022. The stability during this period suggests that MDIs were able to maintain a relatively consistent profit level in proportion to their assets, likely due to steady revenue streams and efficient asset management. However, in 2023, there was a notable drop in profitability to below 2 percent, indicating a sharp decline in returns relative to assets. This decrease may reflect increased operational challenges, such as higher loan defaults, regulatory impacts, or reduced demand for MDI services, which may have put pressure on profit margins.

Figure 8: Net profit as share of asset, 2013 to 2023

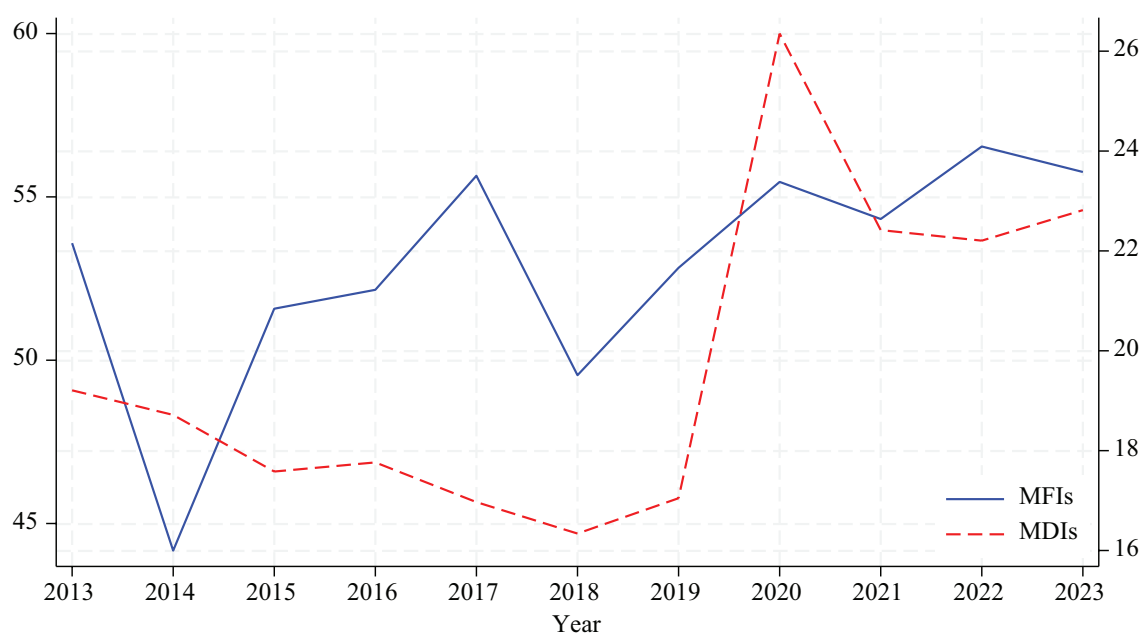


Source: Authors’ elaboration.
 Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions.

In contrast, MFIs showed a downward trend in net profit as a share of assets throughout the same period. Starting at approximately -4 percent in 2016, the profitability of MFIs relative to assets decreases steadily over the years, reaching around -5 percent in 2023. This continuous decline suggests that MFIs have faced increasing profitability challenges, potentially due to rising operational costs, increased competition, or a higher risk profile among borrowers that affects loan repayment rates. The downward trajectory indicates that MFIs may be struggling to maintain profitability at the same pace as their asset growth, illuminating possible inefficiencies or difficulties in scaling operations sustainably.

The trends in net profit as a share of assets highlights the differing financial pressures and performance between MDIs and MFIs. MDIs maintained a relatively stable profit level over most of the period, suggesting better financial resilience and asset management. However, the sharp decline in 2023 indicates emerging challenges that have affected profitability and potentially signal a need for strategic adjustments. On the other hand, MFIs have seen a consistent decline in profitability relative to assets, which could reflect ongoing challenges in maintaining financial sustainability amidst growth. The steady drop may suggest that MFIs are increasingly struggling with operational efficiency, profitability, or both.

Figure 9: Equity asset ratio, 2016 to 2023



Source: Authors' elaboration.

Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions.

Figure 9 illustrates the mean equity-asset ratio over time for MFIs and MDIs in Cambodia from 2013 to 2023. The equity-asset ratio is an important indicator of financial stability by measuring the proportion of an institution's assets financed by equity rather than debt. In this scenario, higher ratios indicate stronger financial resilience.

First, the equity-asset ratio for MFIs fluctuates significantly over the period. Starting at approximately 53 percent in 2013, the ratio declined sharply in 2014 to around 44 percent. This drop suggests a temporary reduction in the equity buffer of MFIs, which may reflect higher debt financing or an expansion in assets outpacing equity growth. Between 2015 and 2017, the ratio stabilised and gradually increased, indicating improved financial resilience as MFIs likely focused on strengthening their equity positions. A noticeable peak occurred in 2022 when the equity-asset ratio for MFIs rose sharply to around 57 percent, which signalled

a strong equity base relative to assets. However, this was followed by a slight decline in 2023. Despite the fluctuations, the ratio consistently remained above 50 percent after 2016, which reflects a strong equity position and consistent equity management practices.

Second, MDIs appeared more stable but exhibited a structural break in their equity-asset ratio. Starting at 19 percent in 2013, the ratio gradually declined to around 16 percent in 2018. However, it increased sharply in 2020 to roughly 26 percent and has maintained levels above 20 percent ever since. The abrupt jump in 2020 was due to a composition effect, as one MFI¹ with higher equity-asset ratio converted to an MDI, thereby pulling up the average equity-asset ratio in the overall MDIs category. In addition, this gradual improvement suggests that MDIs have been bolstering their equity positions, likely in response to regulatory requirements or market conditions that demand stronger financial buffers.

The steady upward trend in MDIs' equity-asset ratio contrasts with the more volatile pattern seen in MFIs, indicating that MDIs may have more consistent equity management strategies and a less variable financial structure. The smaller fluctuations in MDIs' equity-asset ratios suggest greater operational stability compared to MFIs. The equity-asset ratios for both MFIs and MDIs reflect broader trends in financial resilience within Cambodia's microfinance sector. MFIs, with their higher and more volatile ratios, indicate a reliance on equity financing but face fluctuations that may reflect market pressures, asset expansion, or changes in operational strategies. By contrast, MDIs show a more measured and steady improvement in their equity-asset ratios that reflect a more conservative approach to financial management.

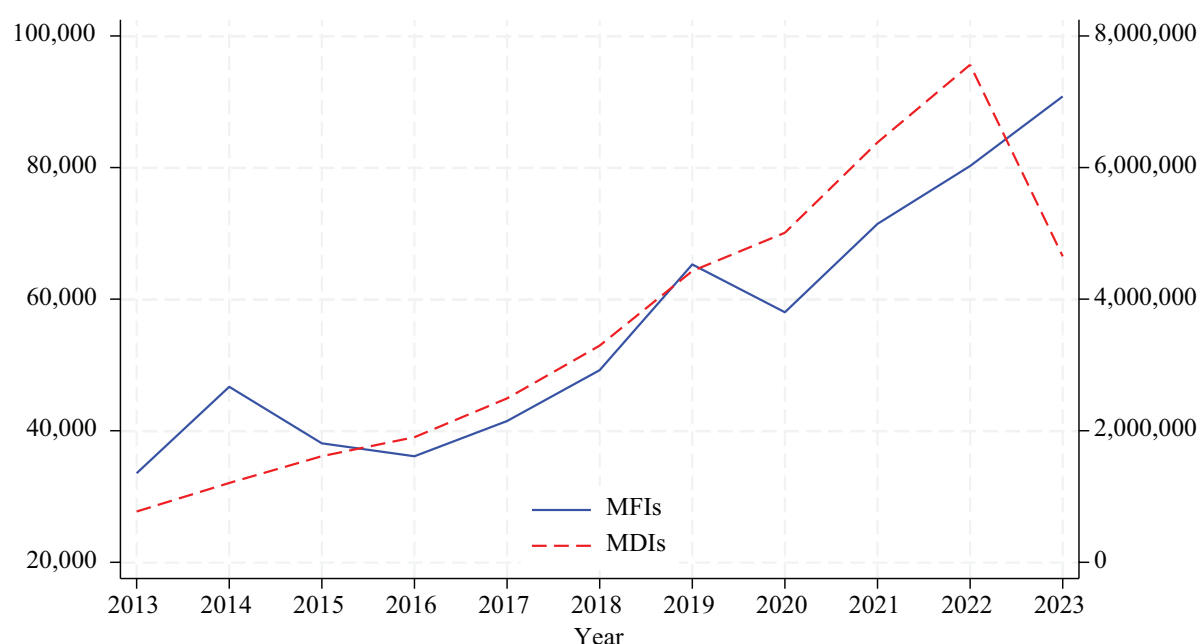
From a policy perspective, the higher equity-asset ratios for MFIs suggest stronger short-term financial buffers, which are critical for institutions serving higher-risk, underserved populations. However, the volatility in MFIs' ratios raises concerns about long-term sustainability and their ability to maintain resilience during economic downturns. For MDIs, the consistent improvement in equity-asset ratios indicates that these institutions are strengthening their financial foundations, which may enhance their ability to transition to more complex financial operations, such as commercial banking.

Figure 10 illustrates the total assets of MDIs and MFIs in Cambodia between 2013 and 2023, and shows distinct growth trends for each category over time. The average assets of MDIs grew substantially from 2013 to 2022. Starting at a low value in 2013, MDI assets rose sharply each year, and peaked by 2022. This rapid increase highlights the expansion and growing importance of MDIs within Cambodia's financial sector, likely driven by increased deposits, expanded lending, and strong investor confidence in these institutions. However, after peaking in 2022, the total assets of MDIs dropped significantly in 2023.

By contrast, the total assets of MFIs exhibited a more modest and consistent growth trend. Starting from a much lower base in 2016, the total assets of MFIs increased gradually over the years, and reached a peak by 2023. This steady growth suggests that MFIs have been able to expand their asset base, albeit at a slower pace compared to MDIs. The gradual increase reflects the continued demand for microfinance services among low-income borrowers and in underserved areas. However, MFIs may face more limitations in asset accumulation due to regulatory constraints or higher risk exposure.

1 Mohanokor Microfinance Institution Plc (MFI) transitioned to Mohanokor Microfinance Deposit-taking Institution Plc. (MDI) after receiving a Deposit License from the National Bank of Cambodia on 17 July 2020.

Figure 10: Total assets, 2016 to 2023



Source: Authors' elaboration.

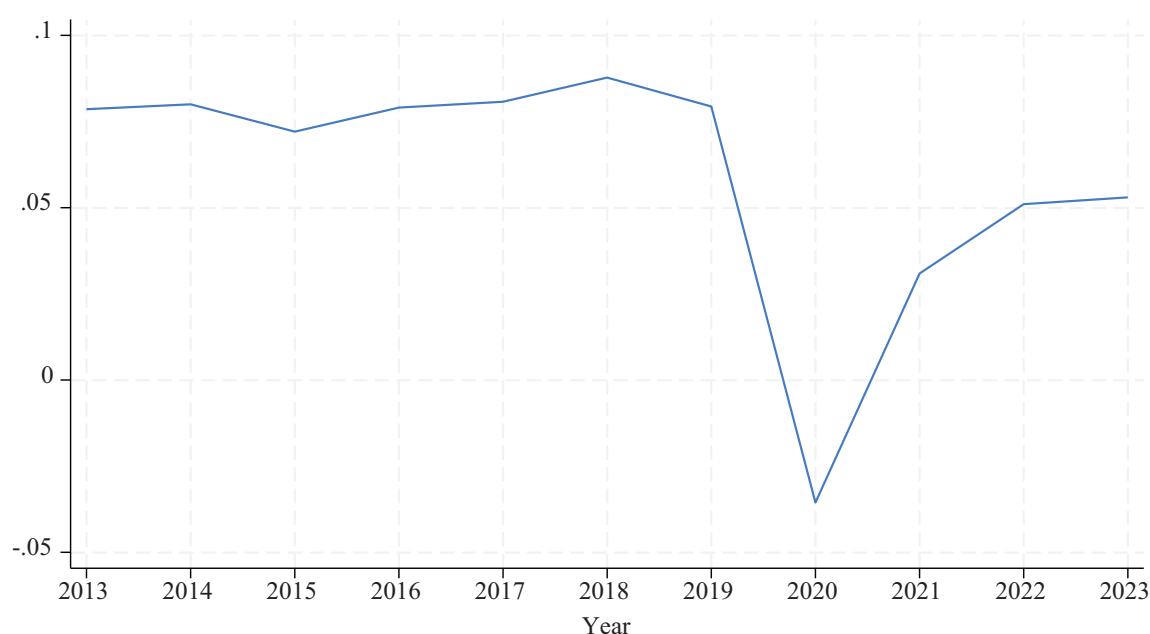
Note: MDIs = Microfinance Deposit-taking Institutions; MFIs = Microfinance Institutions.

E. Macroeconomic variables

Figure 11 describes Cambodia's economic growth rate from 2013 to 2023, and shows fluctuations in the annual growth rate over this period. The data reveals a trend of stable growth in the early years, a significant economic contraction during the COVID-19 pandemic, and a gradual recovery afterwards. From 2013 to 2019, Cambodia's economy experienced robust and stable growth with annual rates consistently remaining around 7 percent or higher. This period of high economic growth was driven by strong performance in key sectors, including garment manufacturing, tourism, construction, and agriculture. Cambodia's integration into global trade networks and FDI further fuelled its economic expansion. The stability during this time reflects effective economic policies and a favourable global economic environment that supported Cambodia's export-driven economy.

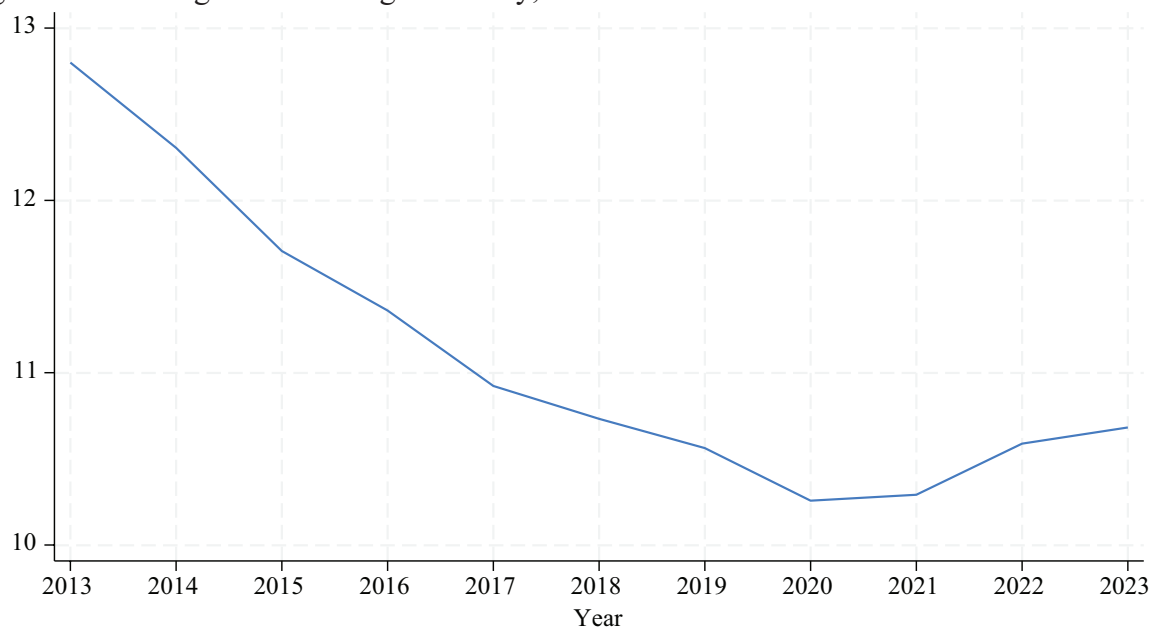
In 2020, Cambodia's economic growth rate experienced a sharp contraction, dropping below zero percent for the first time in the period analysed. This significant decline was primarily due to the global disruptions caused by the COVID-19 pandemic. Key sectors such as tourism, garment exports, and construction faced severe setbacks due to lockdowns, reduced international demand, and supply chain disruptions. The contraction reflects Cambodia's high dependency on external trade and investment, which made the economy particularly vulnerable to global economic shocks. From 2021 onward, Cambodia's economic growth began to recover, although at a slower pace compared to the pre-pandemic years. Growth rates stabilised between 4 and 6 percent by 2023, which indicates a gradual return to economic activity. The recovery has likely been supported by a rebound in tourism, the resumption of construction projects, and continued FDI inflows. However, the slower recovery rate compared to the pre-2020 period suggests lingering challenges, such as global economic uncertainty, inflationary pressures, and disrupted supply chains.

Figure 11: GDP growth, 2013 to 2023



Source: Authors' elaboration.

Figure 12: Lending rate for foreign currency, 2013 to 2023



Source: Authors' elaboration.

Figure 12 depicts the lending rate for foreign currency loans in Cambodia between 2013 and 2023, and highlights a clear downward trend over the decade with stabilisation and a slight rebound in the later years. Between 2013 and 2020, lending rates declined steadily, starting at approximately 13 percent in 2013 and dropping to around 10.26 percent in 2020. This consistent reduction can be attributed to increased competition among financial institutions, improved macroeconomic stability, and policy efforts to promote access to affordable credit. Lower rates during this period likely encouraged borrowing for business expansion and household consumption, supporting economic growth.

However, from 2021 onward, lending rates began to rise gradually and reached approximately 10.68 percent by 2023. This upward trend reflects post-pandemic recovery pressures, inflation, and rising operational costs for financial institutions. The slight increase also suggests that institutions adjusted lending rates to reflect global monetary tightening and changes in funding conditions. The overall trend indicates a significant reduction in borrowing costs over the decade, fostering greater financial inclusion and economic activity. However, the recent uptick in lending rates highlights emerging challenges, such as inflationary pressures and heightened global uncertainty, which may impact the affordability of foreign currency loans in Cambodia. This development underscores the need for continued monitoring of lending rates and their implications for financial accessibility and economic resilience.

4. Empirical findings

4.1. Effect of MFI-to-Banks and geoeconomic fragmentation on Cambodia's financial inclusion

Table 1 presents the results of a dynamic panel model using the GMM estimator to analyse the effect of MFI-to-Bank transitions and global geoeconomic fragmentation on financial inclusion in Cambodia, measured by access to loans. The GMM approach uses the same specification strategy. Diagnostic tests confirm the model's validity: the Arellano-Bond test indicates no significant second-order autocorrelation, and the Hansen test suggests that the instruments used are valid and not over-identified. This econometric framework allows for robust estimation of causal relationships while controlling for time-invariant heterogeneity and dynamic persistence in access to loans.

The coefficient for lagged access to loans is positive and significant (0.7272, $p = 0.045$ in Step 1; 0.9486, $p = 0.000$ in Step 2), indicating strong persistence in financial inclusion. This suggests that higher levels of access to loans in the past positively influence future access. Besides this, other explanatory variables show no significant coefficients. The equity-asset ratio is negative but insignificant (-0.0101, $p = 0.463$ in Step 1; -0.0028, $p = 0.789$ in Step 2). The coefficient for profitability is negative and insignificant (-0.0543, $p = 0.953$ in Step 1; -0.9260, $p = 0.385$ in Step 2). The post-transition variable is positive but insignificant (0.9084, $p = 0.378$ in Step 1). The post-pandemic variable is negative but insignificant (-0.2102, $p = 0.186$ in Step 1). The interaction term is negative and insignificant (-0.9104, $p = 0.573$ in Step 1; 0.1794, $p = 0.827$ in Step 2). The coefficient for economic growth is negative and insignificant (-0.0343, $p = 0.734$ in Step 1; -0.1225, $p = 0.938$ in Step 2). The lending rate for foreign currency loans is negative and insignificant (-0.0343, $p = 0.734$ in Step 1; 0.0772, $p = 0.441$ in Step 2).

The findings, on the one hand, suggest that the strong persistence observed in lagged access to loans is a good predictor for the current value. The insignificant impact of the post-transition variable raises questions about whether transitioning MFIs to banks has any relationship with loan. While banks benefit from stronger regulatory frameworks and expanded operational capacity, these advantages may not translate into greater accessibility for underserved populations. Similarly, the lack of significant interaction between post-transition and post-pandemic suggests that institutional transformations did not substantially mitigate the challenges posed by the pandemic in terms of loan accessibility. Global uncertainty, coupled with lending rates and macroeconomic factors, also appears to have minimal impact on access to loans, reflecting a disconnect between external economic conditions and domestic financial inclusion efforts.

Model A. Effect of MFI-to-Banks on access to loan

Table 1: Effect of MFI-to-Banks on access to loan

Independent variables	Dependent variable: Access to loan					
	Step 1 main effect			Step 2 interaction effect		
	Coef	SE	P Value	Coef	SE	P Value
Lag access to loan	0.7272	0.3628	0.0450	0.9486	0.2636	0.0000
Equity-asset ratio	-0.0101	0.0137	0.4630	-0.0028	0.0106	0.7890
Net profit as a percentage of assets	-0.0544	0.9290	0.9530	-0.9260	1.0664	0.3850
Post transition	0.9085	1.0300	0.3780			
Post pandemic	-0.2102	0.1589	0.1860			
Post transition * post pandemic				0.1794	0.8231	0.8270
Economic growth	-0.9105	1.6162	0.5730	-0.1223	1.5702	0.9380
Lending rate foreign currency	-0.0343	0.1009	0.7340	0.0772	0.1002	0.4410
Constant	3.9964	4.8898	0.4140	0.0409	3.9487	0.9920
Wald Test	100,627			117,935		
Arellano-Bond test for AR (1) Test z =	-1.2100			-1.32		
Pr > z =	0.2280			0.187		
Arellano-Bond test for AR (2) Test z =	0.1100			0.72		
Pr > z =	0.9110			0.472		
Sargan Test: chi2(15) =	31.88			22.8		
Prob > chi2 =	0.007			0.088		
Hansen Test: chi2(15) =	21.53			24.79		
Prob > chi2 =	0.121			0.053		
Difference Hansen Tests	Valid and exogenous			Valid and exogenous		
Number of obs	685			685		
Number of groups	115			115		
Number of instruments	23			22		

Source: Authors' elaboration.

Note: To account for macro-financial disruptions triggered by the COVID-19 pandemic, we include a binary variable, Post-pandemic, coded as 1 for the period 2021-2023 and 0 otherwise. This variable is intended to capture structural changes in the operating environment of financial institutions following the pandemic, including shifts in credit conditions, portfolio quality, and institutional behaviour. For example, as shown in Figure 3, the post-pandemic years in Cambodia were marked by elevated NPLs. This specification is applied to all other models. Coef = coefficient; SE = Standard error.

Model B. Effect of geoeconomic fragmentation on access to loan

Table 2 presents the results from a dynamic panel model using the GMM estimator to assess the effects of MFI-to-Bank transitions and global fragmentation (proxied by WUI) on Cambodia's financial inclusion, measured by access to loans. GMM is applied the same way as previous models by using interaction terms such as post-transition * WUI. Diagnostic tests, including the Arellano-Bond test for autocorrelation and the Hansen test for instrument validity, confirm the model's appropriateness, with no significant second-order autocorrelation and valid instrument specification.

The sign and significant level are almost the same as previous estimations, which the coefficient for lagged access to loans is positive and significant (0.8816, $p = 0.054$ in Step 1; 0.9211, $p = 0.000$ in Step 2), indicating strong persistence in financial inclusion. Moreover, the interaction term post-transition * WUI is positive but insignificant (0.2962, $p = 0.895$ in Step 1; 0.0328, p

= 0.632 in Step 2), suggesting that the combined effect of transitioning institutions and global uncertainty has a limited impact on loan. This result implies that while institutional transitions improve operational capacity, they may not strongly counteract the challenges posed by global fragmentation.

Table 2: Effect of geoeconomic fragmentation on access to loan

<i>Independent variables</i>	<i>Dependent variable: Access to loan</i>					
	Step 1 main effect			Step 2 interaction effect		
	Coef	SE	P Value	Coef	SE	P Value
Lag access to loan	0.8816	0.4572	0.0540	0.9212	0.2588	0.0000
Equity-asset ratio	-0.0039	0.0191	0.8390	-0.0034	0.0102	0.7360
Net profit as a percentage of assets	-0.4599	1.4024	0.7430	-0.9035	1.1118	0.4160
Post transition	0.4497	1.2860	0.7270			
Log WUI	0.4274	0.3454	0.2160			
Post transition * log WUI				0.0328	0.0685	0.6320
Economic growth	0.2962	2.2504	0.8950	-1.4391	2.4393	0.5550
Lending rate foreign currency	0.1001	0.1762	0.5700	0.2581	0.3292	0.4330
Constant	-3.8048	10.5766	0.7190	-1.5372	3.2729	0.6390
Wald Test	114,662			108,350		
Arellano-Bond test for AR (1) Test z =	-1.1700			-1.35		
<i>Pr</i> > z =	0.2410			0.178		
Arellano-Bond test for AR (2) Test z =	0.4800			0.61		
<i>Pr</i> > z =	0.6280			0.542		
Sargan Test: chi2(15) =	28.99			22.57		
<i>Prob</i> > chi2 =	0.016			0.068		
Hansen Test: chi2(15) =	19.45			23.08		
<i>Prob</i> > chi2 =	0.194			0.059		
Difference Hansen Tests	Valid and exogenous			Valid and exogenous		
Number of obs	685			685		
Number of groups	115			115		
Number of instruments	23			21		

Source: Authors' elaboration.

Note: Coef = coefficient; SE = Standard error.

The findings similarly highlight how lagged loan value serve as a good predictor for the current loan value. However, the lack of significant effects for institutional characteristics, such as equity-asset ratio and profitability, suggests that these factors alone do not determine the loan value that the bank loan out to customers. The absence of a significant impact from post-transition implies that transitioning from MFIs to banks does not directly increase nor decrease loan amounts. This may reflect a focus on regulatory compliance and risk management during transitions rather than explicit efforts to increase inclusion. Similarly, the limited effect of global uncertainty suggests that external economic fragmentation may not directly impede financial access, but it also highlights missed opportunities for financial institutions to innovate during periods of uncertainty. Overall, these results indicate limited evidence of significant relationships between institutional transitions, world uncertainty, and access to loans and institutional and external macroeconomic factors are not sufficient to drive financial inclusion.

4.2. Effect of MFI-to-Banks and geoeconomic fragmentation on Cambodia's financial stability

Table 3 presents the results of a dynamic panel model using the GMM estimator to examine the effect of MFI-to-bank transitions on financial stability, proxied by the NPLs in Cambodia. GMM is suitable for addressing endogeneity in panel data models by using lagged variables as instruments. The model includes lagged NPL loans as a dependent variable to capture persistence in NPL levels, while controlling for institution-specific characteristics (e.g., equity-asset ratio, net profit as a percentage of assets), macroeconomic factors (e.g., economic growth), and interaction terms (e.g., post-transition and post-pandemic periods).

Model C. Effect of MFI-to-Banks on NPL

Table 3: Effect of MFI-to-Banks on NPL

<i>Independent variables</i>	<i>Dependent variable: NPL</i>					
	Step 1 main effect			Step 2 interaction effect		
	Coef	SE	P Value	Coef	SE	P Value
Lag NPL loan	0.1577	0.0818	0.0540	0.2054	0.0954	0.0310
Log asset	0.0541	0.0246	0.0280	0.0690	0.0350	0.0480
Equity-asset ratio	0.0021	0.0010	0.0300	0.0027	0.0015	0.0790
Net profit as a percentage of assets	-0.0930	0.1083	0.3900	-0.1347	0.1791	0.4520
Post transition	-0.1983	0.0779	0.0110			
Post pandemic	0.0472	0.0193	0.0140			
Post transition * post pandemic				-0.2525	0.1210	0.0370
Economic growth	0.4165	0.1521	0.0060	0.0102	0.1339	0.9390
Lending rate foreign currency	-0.0018	0.0118	0.8770	-0.0054	0.0147	0.7160
Constant	-0.6417	0.3932	0.1030	-0.7595	0.5748	0.1860
Wald Test	80.65			80.65		
Arellano-Bond test for AR (1) Test z						
=	-1.6700			-1.88		
Pr > z =	0.0950			0.059		
Arellano-Bond test for AR (2) Test z						
=	-1.8400			-1.49		
Pr > z =	0.0660			0.137		
Sargan Test: chi2(15) =	51.34			77.38		
Prob > chi2 =	0.001			0.00		
Hansen Test: chi2(15) =	27.49			31.02		
Prob > chi2 =	0.236			0.122		
Difference Hansen Tests	Valid and exogenous			Valid and exogenous		
Number of obs	806			806		
Number of groups	120			120		
Number of instruments	32			32		

Source: Authors' elaboration.

Note: NPL = Nonperforming Loan; Coef = coefficient; SE = Standard error.

Diagnostic tests, including the Arellano-Bond test for serial correlation and the Hansen test for over-identification restrictions, were used to evaluate the validity of instruments and model specification. The results indicate the absence of second-order serial correlation ($p > 0.05$ for AR(2)) and robustness of instruments (Hansen p -value > 0.05), confirming the reliability of the estimates.

The interpretation of the coefficients for the key variables provides critical insights into the dynamics of NPLs in Cambodia. The Lag NPL Loan variable is positive and significant (0.1577, $p = 0.054$ in Step 1; 0.2054, $p = 0.031$ in Step 2), indicating that past NPL levels are strong predictors of future NPLs. This persistence highlights the importance of addressing existing loan performance issues to prevent their spillover into subsequent periods. The Log Asset variable is also positive and significant (0.0540, $p = 0.028$ in Step 1; 0.0690, $p = 0.048$ in Step 2), suggesting that larger institutions tend to have higher NPL levels. This may result from their exposure to a broader and potentially riskier loan portfolio and underscores the need for tailored risk management strategies in larger institutions.

The equity-asset ratio is positive and significant (0.0020, $p = 0.03$ in Step 1; 0.0027, $p = 0.049$ in Step 2), implying that institutions with higher equity relative to assets may also face slightly elevated NPL levels. This finding could indicate that such institutions are leveraging their equity for riskier lending activities, requiring improved prudential oversight. In contrast, net profit as a percentage of assets is negative and insignificant (-0.0930, $p = 0.39$ in Step 1; -0.1347, $p = 0.452$ in Step 2), suggesting that profitability does not play a significant role in reducing NPLs, which is contrary to expectations. This may reflect the complex relationship between profitability and loan performance, potentially influenced by other factors such as operational efficiency or market conditions.

The post-transition variable is negative and significant (-0.1982, $p = 0.011$ in Step 1; -0.2524, $p = 0.037$ in Step 2), indicating that the transition from MFIs to banks leads to a reduction in NPLs. This is likely due to stronger regulatory oversight, improved governance, and enhanced risk management practices post-transition. However, the post-pandemic variable is positive and significant (0.0471, $p = 0.014$ in Step 1), reflecting the lingering economic impact of COVID-19, which elevated NPL levels due to borrowers' reduced repayment capacities. Importantly, the interaction term post-transition * post-pandemic is negative and significant (-0.2524, $p = 0.037$ in Step 2), suggesting that institutions that transitioned to banks were better equipped to mitigate the pandemic's adverse effects, showcasing the resilience benefits of these transitions.

Finally, economic growth is positive and significant (0.4165, $p = 0.006$ in Step 1), indicating that periods of higher economic growth are associated with elevated NPL levels, possibly due to overexpansion of credit during growth phases. On the other hand, the lending rate for foreign currency is negative but insignificant (-0.0012, $p = 0.877$ in Step 1; -0.0053, $p = 0.716$ in Step 2), suggesting that changes in foreign currency lending rates have minimal direct effects on NPLs. This result may imply that lending rates are not the primary driver of loan performance but could instead interact with other factors such as credit risk and borrower profiles.

On the one hand, one significant implication of these results is that the negative and significant coefficient of the post-transition variable demonstrates that transitioning MFIs to banks strengthens financial stability by reducing NPLs. This finding aligns with the expectation that transitioned institutions benefit from enhanced regulatory oversight, better risk management, and stronger financial frameworks. The interaction term (post-transition * post-pandemic) further supports this conclusion, as these institutions were more resilient to the economic

shocks of the pandemic, likely due to their improved operational structures. This underscores the importance of regulatory support and institutional transformation in bolstering financial resilience. In addition, the resilience observed among transitioned institutions suggests that such transformations can buffer financial systems against external shocks.

On the other hand, the post-pandemic variable highlights the lasting impact of global economic disruptions on Cambodia's financial sector. The significant increase in NPLs during this period reflects borrowers' continued struggles with repayment amid economic uncertainty. The positive association between economic growth and NPLs suggests the potential for over-lending during economic booms, emphasising the need for cautious credit expansion policies.

In summary, the findings highlight the critical role of MFI-to-bank transitions in strengthening Cambodia's financial stability. The results underscore the need for continued institutional reforms, enhanced regulatory oversight, and resilience-building measures to safeguard financial stability in an increasingly uncertain global environment.

Model D. Effect of geoeconomic fragmentation on NPL

Table 4: Effect of geoeconomic fragmentation on NPL

<i>Independent variables</i>	<i>Dependent variable: NPL</i>					
	Step 1 main effect			Step 2 interaction effect		
	Coef	SE	P Value	Coef	SE	P Value
Lag NPL loan	0.1956	0.0828	0.0180	0.2055	0.0890	0.0210
Log asset	0.0697	0.0274	0.0110	0.0728	0.0275	0.0080
Equity-asset ratio	0.0026	0.0011	0.0220	0.0027	0.0012	0.0280
Net profit as a percentage of assets	-0.1142	0.1205	0.3430	-0.1087	0.1483	0.4630
Post transition	-0.2348	0.0996	0.0180			
Log WUI	-0.0527	0.0180	0.0030			
Post transition * WUI				-0.0238	0.0085	0.0050
Economic growth	-0.0173	0.1278	0.8920	0.0804	0.2175	0.7120
Lending rate foreign currency	-0.0089	0.0196	0.6490	-0.0053	0.0247	0.8300
Constant	-0.1823	0.5775	0.7520	-0.7971	0.5430	0.1420
Wald Test	55.79			62.43		
Arellano-Bond test for AR (1) Test z =	-1.8500			-1.84		
<i>Pr > z =</i>	0.0640			0.066		
Arellano-Bond test for AR (2) Test z =	-1.5400			-1.46		
<i>Pr > z =</i>	0.1230			0.145		
Sargan Test: chi2(15) =	60.04			59.58		
<i>Prob > chi2 =</i>	0.000			0.000		
Hansen Test: chi2(15) =	33.24			25.96		
<i>Prob > chi2 =</i>	0.077			0.253		
Difference Hansen Tests	Valid and exogenous			Valid and exogenous		
Number of obs	806			806		
Number of groups	120			120		
Number of instruments	32			30		

Source: Authors' elaboration.

Note: NPL = Nonperforming Loan; Coef = coefficient; SE = Standard error.

The analysis presented in Table 4 employs a dynamic panel data approach using the GMM estimator to explore the effects of MFI-to-bank transitions and global fragmentation on Cambodia's financial stability, proxied by NPLs. This method applied the same specification strategy as the previous model by using the interaction terms (e.g., post-transition * WUI). Diagnostic tests, including the Arellano-Bond test for autocorrelation and the Hansen test for instrument validity, were used to confirm the appropriateness of the model. The Hansen test indicates robust instrument validity ($p > 0.05$), while the Arellano-Bond test suggests no second-order autocorrelation.

The interpretation of coefficients provides key insights into the factors influencing NPLs in Cambodia. The sign and significant level are almost the same as previous estimations. The lag NPL loan variable is positive and significant (0.1956, $p = 0.018$ in Step 1; 0.2055, $p = 0.021$ in Step 2). The log asset variable is positive and significant (0.0696, $p = 0.011$ in Step 1; 0.0727, $p = 0.007$ in Step 2). The equity-asset ratio is also positive and significant (0.0020, $p = 0.02$ in both steps). Net profit as a percentage of assets is negative but insignificant (-0.1141, $p = 0.540$ in Step 1; -0.1087, $p = 0.463$ in Step 2). Other variables, such as economic growth and lending rate (foreign currency), are insignificant in both steps, suggesting limited direct effects on NPL levels. Economic growth (0.0803, $p = 0.712$ in Step 2) appears to have a marginal positive association with NPLs, while lending rate changes (-0.0053, $p = 0.830$ in Step 2) do not show a meaningful impact. These findings suggest that structural and institutional factors play a more prominent role in shaping NPL dynamics compared to macroeconomic or monetary conditions.

The post-transition variable is negative and significant (-0.2347, $p = 0.011$ in Step 1), indicating that transitioning MFIs to banks leads to a reduction in NPLs. Similarly, the Log WUI is negative and significant (-0.0526, $p = 0.003$ in Step 1) suggesting that higher global uncertainty correlates with reduced NPLs. This counterintuitive result may reflect tightened lending practices or increased risk aversion during periods of heightened uncertainty. The interaction term post-transition * WUI is also negative and significant (-0.0238, $p = 0.005$ in Step 2), highlighting that transitioned institutions are better equipped to navigate the adverse effects of global uncertainty and reflecting their enhanced resilience.

The findings underscore the importance of transitioning MFIs to banks in order to strengthen financial stability. The significant negative coefficient for the post-transition variable suggests that transitioning institutions benefit from improved governance, risk management, and regulatory compliance, leading to reduced NPL levels. Additionally, the interaction term (post-transition * WUI) highlights the resilience benefits of these transitions during periods of heightened global uncertainty. This demonstrates that institutional transformation is a key strategy for enhancing the stability of Cambodia's financial sector. The negative and significant coefficient for WUI indicates that global uncertainty correlates with reduced NPLs, likely reflecting conservative lending practices during uncertain periods. However, this result requires further exploration, as it may depend on the specific channels through which uncertainty influences financial institutions. The interaction term (post-transition * WUI) further supports the notion that transitioned institutions are better equipped to navigate fragmented global conditions, highlighting the role of institutional strength in mitigating external shocks. The persistence of NPLs, as indicated by the lagged NPL variable, underscores the need for sustained monitoring and early intervention strategies to prevent NPLs from escalating.

4.3. Robustness checks: Financial institutions' branches as a financial inclusion

To measure financial inclusion at the institutional level, this study employs the *aggregate reported loan amount*. While the total loan volume provides insight into the scale and reach

of credit provision, it does not necessarily reflect the geographic accessibility or service availability of financial institutions, particularly for underserved populations. In the literature, Beck, Demirguc-Kunt, and Martinez Peria (2007) used the number of bank branches and the number of ATMs to characterise access to and use of banking services across countries.

We suggest, therefore, using the other complementary indicator: the *number of branches of financial institutions*. The number of branches serves as a robust proxy for physical access to financial services, especially in developing economies where digital penetration remains uneven. A greater branch density per capita or per geographic area often signals enhanced financial outreach, enabling more individuals and MSMEs to interact with the formal financial system. This indicator is especially relevant in Cambodia, where rural and remote populations face both logistical and informational barriers to accessing finance. Despite the rise of mobile banking and digital platforms, physical infrastructure continues to matter for trust-building, documentation, and compliance, especially for first-time borrowers or savings clients.

Model E. Effect of MFI-to-Banks on number of branches

Table 5: Effect of MFI-to-Banks on number of branches

<i>Independent variables</i>	<i>Dependent variable: Total branches</i>					
	Step 1 main effect			Step 2 interaction effect		
	Coef	SE	P Value	Coef	SE	P Value
Lag total branches	-0.0025	0.0057	0.6660	-0.0088	0.0063	0.1590
Equity-asset ratio	-0.0150	0.0086	0.0830	-0.0227	0.0060	0.0000
Net profit as a percentage of assets	1.2804	1.9884	0.5200	1.1508	0.4731	0.0150
Post transition	3.3284	0.7046	0.0000			
Post pandemic	-0.3373	0.1965	0.0860			
Post transition * post pandemic				3.9761	0.8881	0.0000
Economic growth	-7.6778	1.4519	0.0000	-4.7126	1.3047	0.0000
Lending rate foreign currency	1.5362	0.2497	0.0000	1.8190	0.2714	0.0000
Constant	-13.3527	2.4556	0.0000	-16.2624	2.7994	0.0000
Wald Test	1,030.94			444.37		
AR (1) Test z =	-1.0800			-0.08		
Pr > z =	0.2810			0.94		
AR (2) Test z =	-1.7800			-1.93		
Pr > z =	0.0750			0.053		
Sargan Test: chi2(15) =	7.93			22.55		
Prob > chi2 =	0.047			0.094		
Hansen Test: chi2(15) =	4.06			31.9		
Prob > chi2 =	0.255			0.007		
Difference Hansen Tests	Valid			Valid		
Number of obs	647			647		
Number of groups	109			109		
Number of instruments	11			22		

Source: Authors' elaboration.

Note: Coef = coefficient; SE = Standard error.

Table 5 evaluates how the transformation from MFIs to banks influences branch expansion in Cambodia's financial sector. The key finding is the statistically significant and positive effect of the *post transition* dummy (coef = 3.3284, $p < 0.001$), indicating that institutions that have transitioned tend to expand their branch networks more than their non-transformed counterparts. This effect is further amplified during the post-pandemic recovery period, as shown by the highly significant interaction term *post transition * post pandemic* (coef = 3.9761, $p < 0.001$). This suggests that transformation enhances resilience and expansion capability in the face of macro shocks like COVID-19.

Equity-asset ratio became significant in the interaction model ($p < 0.001$), implying that well-capitalised institutions were better positioned to scale operations post-transition. Similarly, profitability and lending in foreign currency become influential only when interactions are considered, reflecting differentiated behaviour under changing macro-financial conditions. The lagged branch variable is insignificant, suggesting weak persistence in branch expansion decisions. Model diagnostics (Hansen test $p = 0.255$; AR(2) $p = 0.075$) confirm the validity of the dynamic panel estimation.

Model F. Effect of geoeconomic fragmentation on number of branches

Table 6: Effect of geoeconomic fragmentation on number of branches

<i>Independent variables</i>	<i>Dependent variable: Total branches</i>					
	Step 1 main effect			Step 2 interaction effect		
	Coef	SE	P Value	Coef	SE	P Value
Lag total branches	-0.0031	0.0052	0.5520	-0.00376	0.00528	0.4760
Equity-asset ratio	-0.0189	0.0069	0.0060	-0.01921	0.00707	0.0070
Net profit as a percentage of assets	1.0582	0.8082	0.1900	0.90841	0.78650	0.2480
Post transition	3.1466	0.6157	0.0000			
Log WUI	0.2154	0.0951	0.0230			
Post transition * log WUI				0.31767	0.06278	0.0000
Economic growth	-4.9730	1.0942	0.0000	-4.96723	1.11705	0.0000
Lending rate foreign currency	1.7383	0.2650	0.0000	1.73462	0.27099	0.0000
Cons	-17.7123	2.9504	0.0000	-15.45571	2.69060	0.0000
Wald Test	1,463.52			1,274.72		
AR (1) Test z =	-0.9400			-0.46		
Pr > z =	0.3480			0.644		
AR (2) Test z =	-1.7200			-2.01		
Pr > z =	0.0860			0.045		
Sargan Test: chi2(15) =	83.77			78.11		
Prob > chi2 =	0.000			0.000		
Hansen Test: chi2(15) =	25.69			25.8		
Prob > chi2 =	0.001			0.001		
Difference Hansen Tests	Valid			Valid		
Number of obs	647			647		
Number of groups	109			109		
Number of instruments	16			15		

Source: Authors' elaboration.

Note: Coef = coefficient; SE = Standard error.

Table 6 investigates how geoeconomic fragmentation, proxied by the log of the WUI, affects branch expansion among Cambodian financial institutions. The main effect of WUI is marginally significant ($p = 0.023$), suggesting that rising global uncertainty modestly influences institutional expansion. However, the interaction term *post transition* * *log WUI* is highly significant (coef = 0.31767, $p < 0.001$), indicating that financial institutions which have transitioned from MFIs to banks are significantly more sensitive to global uncertainty. This implies that transformed entities are more responsive, either in risk or opportunity, to shifts in the international economic environment.

While the direct effect of post-transition alone is positive but insignificant, the interaction model reveals how WUI amplifies the post-transition effect. The equity-asset ratio and lending rate in foreign currency remained significant, thereby emphasising capital structure and market pricing as key drivers. Economic growth continues to be a robust and negative predictor, aligning with the countercyclical expansion tendency of financial institutions. Although the Sargan test raises minor concerns about instrument overidentification ($p = 0.000$), the Hansen test confirms instrument validity ($p = 0.001$). Overall, findings underscore that financial institutions' expansion strategies are shaped not only by domestic structural changes but also by exposure to global economic fragmentation, particularly for upgraded entities.

5. Conclusion

This study underscores the critical importance of promoting financial inclusion and financial risk in Cambodia's financial sector amidst a global geoeconomic fragmentation. The transition of MFIs into banks has likely proven to be a significant step toward building resilience, enhancing access to credit, and mitigating external economic shocks.

For the *pre-pandemic period*, our study found that financial inclusion was driven primarily by the persistence of prior access to financial services, which indicates a self-reinforcing dynamic. Financial risk, measured through NPLs, demonstrated a downward trend driven by the transition of MFIs. However, rising NPLs are also significantly influenced by lagged NPLs, economic growth, and the size of financial institutions in terms of assets and equity, which highlights the potential for over-lending during economic booms.

During the *post-pandemic period*, our findings suggest the financial landscape became more challenging. NPLs increased during this period due to the adverse impacts of the global pandemic, though NPLs decline during this period, largely due to the positive effects of transitioning MFIs to banks. While global uncertainty correlates with reduced NPLs, likely reflecting more conservative lending, it did not significantly impact loan access. Importantly, transformed institutions expanded their branch networks more than their non-transformed counterparts, with this effect becoming more pronounced during the post-pandemic recovery. Additionally, financial institutions that have transitioned are more responsive to global uncertainty, suggesting heightened sensitivity to both risk and opportunity in a fragmented international environment.

Based on these findings, the authors provide the following policy recommendations:

- The model reveals the strong persistence of past NPLs that could determine the current NPL. As a result, prudent measures should be a priority. Strengthening bank supervision through stress testing exercises, onsite inspections, and preparing resolution arrangements for the high NPLs through loan restructuring are options to address this issue. Such measures will ensure that financial institutions remain resilient in the face of economic uncertainty, especially in a geoeconomic fragmentation.

- While expanding financial inclusion remains crucial, maintaining a balance between access to finance and risk management is equally important. The post-pandemic rise in NPLs highlights the need for better credit assessment practices to verify borrower credibility. Financial institutions should focus on promoting productive loans that support business expansion and investment rather than non-productive lending. Ensuring that borrowers have the financial capacity to repay loans will contribute to the long-term sustainability of the financial sector.
- Given the rising NPL levels, it is essential to fast-track the implementation of a deposit insurance scheme to further strengthen financial system stability and maintain depositor confidence. A well-structured deposit insurance system can help prevent panic-driven bank runs and enhance public trust in the financial sector, particularly during economic downturns. Establishing this mechanism promptly will reinforce financial resilience and protect depositors from potential losses.
- Over-reliance on foreign capital inflows presents a long-term vulnerability for Cambodia's financial sector. The potential for sudden capital withdrawals poses external risks that could disrupt economic stability. To mitigate this, policymakers should focus on promoting domestic capital mobilisation by developing local funding platforms. Encouraging domestic investment and fostering a self-sustaining financial ecosystem will reduce dependency on volatile foreign capital and ensure a more stable economic environment.
- The evidence of MFIs transitioning to banks and its relation in reducing NPLs, even in the uncertain context, demonstrates that it is worth considering encouraging consolidation in the financial sector through mergers and acquisitions. In particular, mergers and acquisitions can help maintain the sector's survival and improve efficiency while ensuring financial inclusion of low-income and rural populations. Well-managed consolidation efforts can help improve economies of scale, strengthen governance frameworks, and ensure long-term sectoral stability.
- Transitioning MFIs into banks should be guided by sustainable growth strategies rather than be driven by regulatory pressures or institutional distress. While the transition can enhance financial resilience and expand credit access, it should be encouraged only when MFIs demonstrate strong financial health and growth potential. Policymakers should ensure that such transitions are well-planned, with appropriate regulatory support to facilitate a smooth and beneficial transformation.
- The role of commercial banks in providing microcredits should be reassessed to prevent unnecessary overlaps with MFIs. While this study does not include disaggregated loan-size data, policy literature and stakeholder discussions have highlighted growing overlaps in the provision of microcredit by commercial banks and MFIs. To safeguard the financial system's inclusivity and specialisation, future regulatory dialogues should consider exploring clearer institutional definitions, particularly in terms of client targeting, product structuring, and risk assessment. As some commercial banks expand their retail outreach, it is important to ensure that MFIs continue to serve their core low-income and rural client base without being crowded out. This recommendation is intended as a strategic consideration for future policy inquiry rather than a direct finding from the panel analysis and should be revisited when borrower-level or loan-size-segmented data become available.

Our study has some limitations. First, due to the unavailability of granular data, we do not have access to loan data at the customer level. Consequently, relying on aggregate loan amounts by institution may not be an ideal indicator for measuring financial access (i.e., access to loans). Future research could address this limitation by incorporating more detailed, customer-level data. In addition, while the model effectively captures key relationships, the insignificant role of profitability and lending rates raises questions about whether additional variables, such as sectoral risk exposure and borrower characteristics, might better explain variations in NPLs. Additionally, the study employs the WUI to represent uncertainty over time, which we hypothesise is, to some extent, a result of global fragmentation. Future research could benefit from using a variety of indices to further explore and validate the real impact of global geo-economic fragmentation.

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Annexes

Annexe A1: Reports of NBC on microfinance

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|----|--|
| 1 | Comparative Report on Total Assets |
| 2 | Report on Registered Equity Ratio |
| 3 | Balance Sheet Report |
| 4 | Report on Asset and Inactive Asset Ratios (%) |
| 5 | Profit-Loss Report |
| 6 | Net Profit Report |
| 7 | Comparative Report on Total Deposits |
| 8 | Deposit Report by Account Type |
| 9 | Total Loans and Non-Performing Loans Report |
| 10 | Total Loans by Business Type Report |
| 11 | Loans by Business Type Report |
| 12 | Loan-to-Deposit Ratio Report |
| 13 | Report on Number of Branches and Operational Areas of MFIs |
| 14 | Staff Number Report |
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Source: Authors' elaboration.

Annexe A2: List of financial institutions

No.	Name	No.	Name	No.	Name
1	AMK	41	Golden Cash	81	RAFCO
2	AMZ	42	Grow	82	Rolya
3	ANAKUT	43	Hattha Kaksekar	83	Royal Microfinance
4	Active People	44	Hattha Bank Plc.	84	SAMIC
5	Aeon	45	Idemitsu Saison	85	SAWAD RUNG REUNG FINANCE (CAMBODIA) PLC
6	Amatak	46	Intean Poalroath Rongroeurng	86	Sabay Credit
7	Amret	47	JACCS	87	Sachak
8	Angkor ACE Star Credits	48	JC Finance	88	Sahaka
9	Apple Finance	49	JET's Cash Box	89	Sahakrinpheap
10	Farmer Union Development Fund	50	Prasac	90	Samaky
11	Atom Capital	51	KB Prasac Bank Plc.	91	Sambat
12	BAMC Finance	52	KEY Microfinance	92	Samporn Samakum Sahakreas Thuntoch neung matjum Kampuchea Plc.
13	BAYON Credit	53	Khemarak Microfinance Institution	93	Samrithisak Microfinance Limited
14	BNKC	54	Khmer Capital	94	Sathapana Limited
15	BORIBO	55	Kongkea Capital	95	Sathapana Bank Plc.
16	Baitang Microheranhvatho	56	LBP	96	Seilanithih
17	Bamboo Finance	57	LCH	97	Serey Oudom
18	CAM Capital	58	LED	98	Side Hustle
19	CBIRD	59	LOLC	99	Sixty Six
20	CMK	60	LY HOUR	100	Soksan
21	Cambodia Labour Care	61	Leng Navatra	101	Sonatra
22	Camma	62	MET PP Finance	102	Srey Oudom
23	Century Cambo Development	63	MIA	103	Sunny
24	Cellcard	64	Mango	104	T&Go
25	Chailease Royal Finance	65	Maxima	105	TBB
26	Chamroeun	66	Mohanokor	106	Taca
27	Chokchey	67	Mother Financial Japan	107	Thaneakea Phum
28	City Microfinance	68	Niron	108	Thida Srisawad
29	Collective Win	69	NongHyup	109	Trop Khnhom

30	Corich Microfinance	70	Oro	110	Vithey Microfinance
31	Delta Microfinance	71	PG Development	111	Vivath Golden
32	EAP	72	Kredit Microfinance	112	Vision fund
33	EAST Micro	73	Phillip Bank Plc.	113	Green Central Microfinance
34	Evergreen Microfinance	74	Piphup Thmey	114	Welcome Finance
35	Family Microfinance	75	Ponleu Chaktomuk	115	Woori Finance
36	Farmer Finance	76	Prasethpheap	116	WB Finance
37	Fist Finance	77	Prime	117	Woori Bank (Cambodia) Plc.
38	Funan Microfinance	78	Prince	118	Malis
39	Futaba Microfinance	79	Propey Microfinance	119	YCP
40	GB Microfinance	80	Queen Finance	120	YLP

Source: Authors' elaboration.

Annexe A3: Autocorrelation of the dependent variable “NPL Loan Ratio”

LAG AC	PAC	Q	Prob>Q
1 0.6403	0.6630	5.8621	0.0155
2 0.1284	-0.3219	6.124	0.0468
3 -0.1044	-0.0384	6.319	0.0971
4 -0.2006	.	7.1414	0.1286
5 -0.2367	.	8.4769	0.1318
6 -0.1851	.	9.4569	0.1495
7 -0.1664	.	10.447	0.1646
8 -0.2014	.	12.381	0.1350
9 -0.1343	.	13.67	0.1346
10 -0.0396	.	13.895	0.1779
. restore			

Source: Authors' elaboration.

Note: The Ljung-Box Q-test at lag 1 is highly significant ($p = 0.0155$), confirming strong autocorrelation with a high coefficient (0.6630). At lag 2, the autocorrelation weakens, and beyond lag 2, it is insignificant. Thus, we include only the first lag in our dynamic panel regression model.

Annexe A4: Variables description

Variable	Description	Source
<i>NPL ratio</i>	Non-performing loan as percentage of total loan. NBC classifies the loan status in 5 categories: normal, special mention, substandard, doubtful and loss. Loan is considered as non-performing loan when it falls into the third category or higher (late payment for more than 31 and 90 days respectively for short-term and long-term loan)	NBC
<i>Log loan</i>	Aggregate reported loan amount (institution-level, in log value)	NBC
<i>Log total branches</i>	Total branches of financial institutions (institution-level, in log value)	NBC
<i>Log asset</i>	Aggregate asset amount (institution-level, in log value)	NBC
<i>Equity-asset Ratio</i>	Ratio of equity to asset (institution-level, in log value)	NBC
<i>Net profit as a percentage of assets</i>	Ration of net profit to asset (institution-level, in log value)	NBC
<i>Post transition</i>	Dummy variable with the value of 1 indicating an MFI/MDI transited to bank for a certain referenced period	MFI/MDI's websites, news article
<i>Log World Uncertainty Index (WUI)</i>	The World Uncertainty Index is a measure that tracks uncertainty across the globe by text mining the country reports of the Economist Intelligence Unit.	World Uncertainty Index
<i>Economic growth</i>	Real GDP growth rate (using newly rebased 2014 GDP data)	NIS
<i>Lending Rate Foreign Currency</i>	Lending rate for USD	International Financial Statistic

Source: Authors' elaboration.

Annexe A5: Effect of MFI-to-Banks on access to loan: Step 1 main effect

Access to loan as dependent variable	Coefficient	std. err.	P Value
Lag access to loan	0.7272127	0.3628396	0.045
Equity-asset ratio	-0.0100932	0.0137406	0.463
Net profit as a percentage of assets	-0.0543849	0.9290021	0.953
Post transition	0.9084678	1.029997	0.378
Post pandemic	-0.2102169	0.1588787	0.186
Post transition * post pandemic			
Economic growth	-0.9104825	1.616164	0.573
Lending rate foreign currency	-0.0343263	0.1009216	0.734
Cons	3.996352	4.889831	0.414
Number of obs = 685			
Time variable: Year	Number of groups = 115		
Number of instruments = 23	Obs per group: min = 1		
Wald chi2(7) = 100626.97	Avg = 5.96		
Prob > chi2 = 0.000	Max = 10		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).Netprofitaspercentageofasse collapsed			
L(1/8).lag_NPL_Loan collapsed			
Instruments for levels equation			
Standard			
post_transit1 Post_pandemic EquityAssetRatio Growth			
LendingRateForeignCurrency			
_cons			
Arellano-Bond test for AR(1) in first differences: z = -1.21 Pr > z = 0.228			
Arellano-Bond test for AR(2) in first differences: z = 0.11 Pr > z = 0.911			
Sargan test of overid. restrictions: chi2(15) = 31.88 Prob > chi2 = 0.007			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(15) =			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(7) = 9.54 Prob > chi2 = 0.216			
Difference (null H = exogenous): chi2(8) = 11.99 Prob > chi2 = 0.152			
gmm(Netprofitaspercentageofasse, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(6) = 7.41 Prob > chi2 = 0.284			
Difference (null H = exogenous): chi2(9) = 14.12 Prob > chi2 = 0.118			
iv(post_transit1 Post_pandemic EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(10) = 10.17 Prob > chi2 = 0.426			
Difference (null H = exogenous): chi2(5) = 11.37 Prob > chi2 = 0.045			

Source: Authors' elaboration.

Annexe A6: Effect of MFI-to-Banks on access to loan: Step 2 interaction effect

Access to loan as dependent variable	Coefficient	std. err.	P Value
Lag access to loan	0.9485758	0.2635763	0.000
Equity-asset ratio	-0.0028416	0.0106047	0.789
Net profit as a percentage of assets	-0.9260044	1.066355	0.385
Post transition			
Post pandemic			
Post transition * post pandemic	0.1794148	0.8230927	0.827
Economic growth	-0.1222539	1.570201	0.938
Lending rate foreign currency	0.077218	0.1002379	0.441
Cons	0.0408582	3.948663	0.992
Number of obs = 685			
Time variable: Year	Number of groups = 115		
Number of instruments = 22	Obs per group: min = 1		
Wald chi2(6) = 117934.50	Avg = 5.96		
Prob > chi2 = 0.000	Max = 10		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).Netprofitaspercentageofasse collapsed			
L(1/8).lag_NPL_Loan collapsed			
Instruments for levels equation			
Standard			
Post_transit1_Post_Pandemic EquityAssetRatio Growth			
LendingRateForeignCurrency			
_cons			
Arellano-Bond test for AR(1) in first differences: z = -1.32 Pr > z = 0.187			
Arellano-Bond test for AR(2) in first differences: z = 0.72 Pr > z = 0.472			
Sargan test of overid. restrictions: chi2(15) = 22.80 Prob > chi2 = 0.088			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(15) = 24.79 Prob > chi2 = 0.053			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(7) = 10.11 Prob > chi2 = 0.183			
Difference (null H = exogenous): chi2(8) = 14.68 Prob > chi2 = 0.066			
gmm(Netprofitaspercentageofasse, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(6) = 9.23 Prob > chi2 = 0.161			
Difference (null H = exogenous): chi2(9) = 15.55 Prob > chi2 = 0.077			
iv(Post_transit1_Post_Pandemic EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(11) = 18.83 Prob > chi2 = 0.064			
Difference (null H = exogenous): chi2(4) = 5.95 Prob > chi2 = 0.203			

Source: Authors' elaboration.

Annexe A7: Effect of fragmented world on access to loan: Step 1 main effect

Access to loan as dependent variable	Coefficient	std. err.	P Value
Lag access to loan	0.8815658	0.457163	0.054
Equity-asset ratio	-0.0038743	0.0191158	0.839
Net profit as a percentage of assets	-0.459897	1.402398	0.743
Post transition	0.4496843	1.286035	0.727
Log WUI	0.4273762	0.3453904	0.216
Post transition * log WUI			
Economic growth	0.2961972	2.2504	0.895
Lending rate foreign currency	0.100067	0.1762358	0.57
Cons	-3.804787	10.57661	0.719
Number of obs = 685			
Time variable: Year	Number of groups = 115		
Number of instruments = 23	Obs per group: min = 1		
Wald chi2(7) = 114661.70	Avg = 5.96		
Prob > chi2 = 0.000	Max = 10		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).Netprofitaspercentageofasse collapsed			
L(1/8).lag_NPL_Loan collapsed			
Instruments for levels equation			
Standard			
post_transit1 log_WUI EquityAssetRatio Growth LendingRateForeignCurrency			
_cons			
Arellano-Bond test for AR(1) in first differences: z = -1.17 Pr > z = 0.241			
Arellano-Bond test for AR(2) in first differences: z = 0.48 Pr > z = 0.628			
Sargan test of overid. restrictions: chi2(15) = 28.99 Prob > chi2 = 0.016			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(15) = 19.45 Prob > chi2 = 0.194			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(7) = 8.30 Prob > chi2 = 0.307			
Difference (null H = exogenous): chi2(8) = 11.15 Prob > chi2 = 0.193			
gmm(Netprofitaspercentageofasse, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(6) = 6.06 Prob > chi2 = 0.417			
Difference (null H = exogenous): chi2(9) = 13.39 Prob > chi2 = 0.146			
iv(post_transit1 log_WUI EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(10) = 16.37 Prob > chi2 = 0.090			
Difference (null H = exogenous): chi2(5) = 3.08 Prob > chi2 = 0.688			

Source: Authors' elaboration.

Annexe A8: Effect of fragmented world on access to loan: Step 2 interaction effect

Access to loan as dependent variable	Coefficient	std. err.	P Value
Lag access to loan	0.9211907	0.258751	0.000
Equity-asset ratio	-0.0034326	0.0101995	0.736
Net profit as a percentage of assets	-0.9034536	1.111829	0.416
Post transition			
Log WUI			
Post transition * WUI	0.0327547	0.0684566	0.632
Economic growth	-1.439091	2.439316	0.555
Lending rate foreign currency	0.2580543	0.3291814	0.433
Cons	-1.537175	3.272946	0.639
Number of obs = 685			
Time variable: Year	Number of groups = 115		
Number of instruments = 21	Obs per group: min = 1		
Wald chi2(6) = 108350.15	Avg = 5.96		
Prob > chi2 = 0.000	Max = 10		

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(2/10).Netprofitaspercentageofasse collapsed

L(1/8).lag_NPL_Loan collapsed

Instruments for levels equation

Standard

Post_transit1_1_WUI EquityAssetRatio

Growth

_cons

Arellano-Bond test for AR(1) in first differences: z = -1.35 Pr > z = 0.178

Arellano-Bond test for AR(2) in first differences: z = 0.61 Pr > z = 0.542

Sargan test of overid. restrictions: chi2(14) = 22.57 Prob > chi2 = 0.068

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(14) = 23.08 Prob > chi2 = 0.059

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))

Hansen test excluding group: chi2(6) = 7.35 Prob > chi2 = 0.289

Difference (null H = exogenous): chi2(8) = 15.73 Prob > chi2 = 0.046

gmm(Netprofitaspercentageofasse, collapse eq(diff) lag(2 .))

Hansen test excluding group: chi2(5) = 6.27 Prob > chi2 = 0.281

Difference (null H = exogenous): chi2(9) = 16.81 Prob > chi2 = 0.052

iv(Post_transit1_1_WUI EquityAssetRatio Growth, eq(level))

Hansen test excluding group: chi2(11) = 20.57 Prob > chi2 = 0.038

Difference (null H = exogenous): chi2(3) = 2.51 Prob > chi2 = 0.474

Source: Authors' elaboration.

Annexe A9: Effect of MFI-to-Banks on NPL: Step 1 main effect

NPL Loan as dependent variable	Coefficient	std. err.	P Value
Lag NPL loan	0.1576913	0.0817631	0.054
Log asset	0.0540582	0.0246009	0.028
Equity-asset ratio	0.0020706	0.0009528	0.03
Net profit as a percentage of assets	-0.0930021	0.1082591	0.39
Post transition	-0.1982775	0.077908	0.011
Post pandemic	0.0471611	0.0192717	0.014
Post transition * post pandemic			
Economic growth	0.4165082	0.1520918	0.006
Lending rate foreign currency	-0.0018284	0.0117986	0.877
Cons	-0.6416615	0.3931911	0.103
Number of obs = 806	Obs per group: min = 1		
Time variable: Year	Wald chi2(8) = 80.65		
Number of groups = 120	avg = 6.72		
Number of instruments = 32	Prob > chi2 = 0.000 max = 11		

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(2/10).(Netprofitaspercentageofasse log_asset) collapsed

L(1/8).lag_NPL_Loan collapsed

Instruments for levels equation

Standard

post_transit1 Post_pandemic EquityAssetRatio Growth

LendingRateForeignCurrency

_cons

Arellano-Bond test for AR(1) in first differences: z = -1.67 Pr > z = 0.095

Arellano-Bond test for AR(2) in first differences: z = -1.84 Pr > z = 0.066

Sargan test of overid. restrictions: chi2(23) = 51.34 Prob > chi2 = 0.001

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(23) = 27.49 Prob > chi2 = 0.236

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))

Hansen test excluding group: chi2(15) = 14.10 Prob > chi2 = 0.518

Difference (null H = exogenous): chi2(8) = 13.39 Prob > chi2 = 0.099

gmm(Netprofitaspercentageofasse log_asset, collapse eq(diff) lag(2 .))

Hansen test excluding group: chi2(5) = 8.42 Prob > chi2 = 0.135

Difference (null H = exogenous): chi2(18) = 19.07 Prob > chi2 = 0.388

iv(post_transit1 Post_pandemic EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))

Hansen test excluding group: chi2(18) = 23.33 Prob > chi2 = 0.178

Difference (null H = exogenous): chi2(5) = 4.16 Prob > chi2 = 0.527

Source: Authors' elaboration.

Annexe A10: Effect of MFI-to-Banks on NPL: Step 2 interaction effect

NPL Loan as dependent variable	Coefficient	std. err.	P Value
Lag NPL loan	0.2054055	0.0954146	0.031
Log asset	0.0690309	0.0349708	0.048
Equity-asset ratio	0.0027223	0.001548	0.079
Net profit as a percentage of assets	-0.1346851	0.1791217	0.452
Post transition			
Post pandemic			
Post transition * post pandemic	-0.2524679	0.1210475	0.037
Economic growth	0.0101699	0.1338708	0.939
Lending rate foreign currency	-0.0053593	0.0147359	0.716
Cons	-0.7595101	0.5748288	0.186
Number of obs = 806	Obs per group: min = 1		
Time variable: Year	Wald chi2(8) = 80.65		
Number of groups = 120	Avg = 6.72		
Number of instruments = 32	Prob > chi2 = 0.000		
	Max = 11		
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).(Netprofitaspercentageofasse log_asset) collapsed			
L(1/8).lag_NPL_Loan collapsed			
Instruments for levels equation			
Standard			
Post_transit1_Post_Pandemic EquityAssetRatio Growth			
LendingRateForeignCurrency			
_cons			
Arellano-Bond test for AR(1) in first differences: z = -1.88 Pr > z = 0.059			
Arellano-Bond test for AR(2) in first differences: z = -1.49 Pr > z = 0.137			
Sargan test of overid. restrictions: chi2(23) = 77.38 Prob > chi2 = 0.000			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(23) = 31.02 Prob > chi2 = 0.122			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(15) = 20.27 Prob > chi2 = 0.162			
Difference (null H = exogenous): chi2(8) = 10.74 Prob > chi2 = 0.217			
gmm(Netprofitaspercentageofasse log_asset, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(5) = 7.38 Prob > chi2 = 0.194			
Difference (null H = exogenous): chi2(18) = 23.64 Prob > chi2 = 0.167			
iv(Post_transit1_Post_Pandemic EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(19) = 26.42 Prob > chi2 = 0.119			
Difference (null H = exogenous): chi2(4) = 4.59 Prob > chi2 = 0.332			

Source: Authors' elaboration.

Annexe A11: Effect of fragmented world on NPL: Step 1 main effect

NPL Loan as dependent variable	Coefficient	std. err.	P Value
Lag NPL loan	0.1955686	0.0828393	0.018
Log asset	0.0696644	0.0274395	0.011
Equity-asset ratio	0.0026252	0.0011449	0.022
Net profit as a percentage of assets	-0.1141629	0.1204504	0.343
Post transition	-0.234776	0.0995914	0.018
Log WUI	-0.0526597	0.0180178	0.003
Post transition * WUI			
Economic growth	-0.0172974	0.1278451	0.892
Lending rate foreign currency	-0.0089255	0.0196306	0.649
Cons	-0.1822655	0.5775094	0.752
Number of obs = 806			
Time variable: Year	Number of groups = 120		
Number of instruments = 32	Obs per group: min = 1		
Wald chi2(8) = 55.79	Avg = 6.72		
Prob > chi2 = 0.000	Max = 11		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).(Netprofitaspercentageofasse log_asset) collapsed			
L(1/8).lag_NPL_Loan collapsed			
Instruments for levels equation			
Standard			
post_transit1 log_WUI EquityAssetRatio Growth LendingRateForeignCurrency			
_cons			
Arellano-Bond test for AR(1) in first differences: z = -1.85 Pr > z = 0.064			
Arellano-Bond test for AR(2) in first differences: z = -1.54 Pr > z = 0.123			
Sargan test of overid. restrictions: chi2(23) = 60.04 Prob > chi2 = 0.000			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(23) = 33.24 Prob > chi2 = 0.077			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(15) = 23.38 Prob > chi2 = 0.076			
Difference (null H = exogenous): chi2(8) = 9.86 Prob > chi2 = 0.275			
gmm(Netprofitaspercentageofasse log_asset, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(5) = 4.65 Prob > chi2 = 0.461			
Difference (null H = exogenous): chi2(18) = 28.60 Prob > chi2 = 0.054			
iv(post_transit1 log_WUI EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(18) = 18.92 Prob > chi2 = 0.397			
Difference (null H = exogenous): chi2(5) = 14.32 Prob > chi2 = 0.014			

Source: Authors' elaboration.

Annexe A12: Effect of fragmented world on NPL: Step 2 interaction effect

NPL Loan as dependent variable	Coefficient	std. err.	P Value
Lag NPL loan	0.2054600	0.0889605	0.021
Log asset	0.0727528	0.0275477	0.008
Equity-asset ratio	0.0026923	0.001222	0.028
Net profit as a percentage of assets	-0.1086875	0.1482577	0.463
Post transition			
Log WUI			
Post transition * WUI	-0.0238497	0.008548	0.005
Economic growth	0.0803533	0.2174845	0.712
Lending rate foreign currency	-0.0053035	0.0246957	0.83
Cons	-0.7970536	0.5429637	0.142
Number of obs = 806			
Time variable: Year	Number of groups = 120		
Number of instruments = 30	Obs per group: min = 1		
Wald chi2(7) = 62.43	Avg = 6.72		
Prob > chi2 = 0.000	Max = 11		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).(Netprofitaspercentageofasse log_asset) collapsed			
L(1/8).lag_NPL_Loan collapsed			
Instruments for levels equation			
Standard			
Post_transit1_1_WUI EquityAssetRatio Growth			
_cons			
Arellano-Bond test for AR(1) in first differences: z = -1.84 Pr > z = 0.066			
Arellano-Bond test for AR(2) in first differences: z = -1.46 Pr > z = 0.145			
Sargan test of overid. restrictions: chi2(22) = 59.58 Prob > chi2 = 0.000			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(22) = 25.96 Prob > chi2 = 0.253			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_NPL_Loan, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(14) = 17.05 Prob > chi2 = 0.254			
Difference (null H = exogenous): chi2(8) = 8.91 Prob > chi2 = 0.350			
gmm(Netprofitaspercentageofasse log_asset, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(4) = 5.04 Prob > chi2 = 0.283			
Difference (null H = exogenous): chi2(18) = 20.92 Prob > chi2 = 0.283			
iv(Post_transit1_1_WUI EquityAssetRatio Growth, eq(level))			
Hansen test excluding group: chi2(19) = 23.27 Prob > chi2 = 0.226			
Difference (null H = exogenous): chi2(3) = 2.69 Prob > chi2 = 0.442			

Source: Authors' elaboration.

Annexe A13: Effect of MFI-to-Banks on number of branches: Step 1 main effect

Total branch as dependent variable	Coefficient	std. err.	P Value
Lag total branch	-0.0025	0.0057	0.6660
Equity-asset ratio	-0.0150	0.0086	0.0830
Net profit as a percentage of assets	1.2804	1.9884	0.5200
Post transition	3.3284	0.7046	0.0000
Post pandemic	-0.3373	0.1965	0.0860
Post transition * post pandemic			
Economic growth	-7.6778	1.4519	0.0000
Lending rate foreign currency	1.5362	0.2497	0.0000
Cons	-13.3527	2.4556	0.0000
Number of obs = 647			
Time variable : Year	Number of groups = 109		
Number of instruments = 11	Obs per group: min = 1		
Wald chi2(7) = 1030.94	Avg = 5.94		
Prob > chi2 = 0.000	Max = 10		

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(2/3).Netprofitaspercentageofasse collapsed

L(1/3).lag_total_branch collapsed

Instruments for levels equation

Standard

post_transit1 Post_pandemic EquityAssetRatio Growth

LendingRateForeignCurrency

_cons

Arellano-Bond test for AR(1) in first differences: z = -1.08 Pr > z = 0.281

Arellano-Bond test for AR(2) in first differences: z = -1.78 Pr > z = 0.075

Sargan test of overid. restrictions: chi2(3) = 7.93 Prob > chi2 = 0.047

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(3) = 4.06 Prob > chi2 = 0.255

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:

gmm(lag_total_branch, collapse eq(diff) lag(1 3))

Hansen test excluding group: chi2(0) = 0.00 Prob > chi2 = .

Difference (null H = exogenous): chi2(3) = 4.06 Prob > chi2 = 0.255

gmm(Netprofitaspercentageofasse, collapse eq(diff) lag(23))

Hansen test excluding group: chi2(1) = 0.02 Prob > chi2 = 0.898

Difference (null H = exogenous): chi2(2) = 4.04 Prob > chi2 = 0.132

Source: Authors' elaboration.

Annexe A14: Effect of MFI-to-Banks on number of branches: Step 2 interaction effect

Total branch as dependent variable	Coefficient	std. err.	P Value
Lag total branch	-0.00883	0.00627	0.1590
Equity-asset ratio	-0.02268	0.00598	0.0000
Net profit as a percentage of assets	1.15084	0.47311	0.0150
Post transition			
Post pandemic			
Post transition * post pandemic	3.97615	0.88808	0.0000
Economic growth	-4.71256	1.30472	0.0000
Lending rate foreign currency	1.81904	0.27137	0.0000
Cons	-16.26243	2.79936	0.0000
Number of obs = 647			
Time variable : Year	Number of groups = 109		
Number of instruments = 22	Obs per group: min = 1		
Wald chi2(6) = 444.37	Avg = 5.94		
Prob > chi2 = 0.000	Max = 10		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/10).Netprofitaspercentageofasse collapsed			
L(1/8).lag_total_branch collapsed			
Instruments for levels equation			
Standard			
Post_transit1_Post_Pandemic EquityAssetRatio Growth			
LendingRateForeignCurrenc _cons			
Arellano-Bond test for AR(1) in first differences: z = -0.08 Pr > z = 0.940			
Arellano-Bond test for AR(2) in first differences: z = -1.93 Pr > z = 0.053			
Sargan test of overid. restrictions: chi2(15) = 22.55 Prob > chi2 = 0.094			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(15) = 31.90 Prob > chi2 = 0.007			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets:			
gmm(lag_total_branch, collapse eq(diff) lag(1 8))			
Hansen test excluding group: chi2(7) = 3.39 Prob > chi2 = 0.847			
Difference (null H = exogenous): chi2(8) = 28.51 Prob > chi2 = 0.000			
gmm(Netprofitaspercentageofasse, collapse eq(diff) lag(2 .))			
Hansen test excluding group: chi2(6) = 25.01 Prob > chi2 = 0.000			
Difference (null H = exogenous): chi2(9) = 6.89 Prob > chi2 = 0.649			
iv(Post_transit1_Post_Pandemic EquityAssetRatio Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(11) = 13.17 Prob > chi2 = 0.283			
Difference (null H = exogenous): chi2(4) = 18.73 Prob > chi2 = 0.001			

Source: Authors' elaboration.

Annexe A15: Effect of fragmented world on number of branches: Step 1 main effect

Total branch as dependent variable	Coefficient	std. err.	P Value
Lag total branch	-0.0031	0.0052	0.5520
Equity-asset ratio	-0.0189	0.0069	0.0060
Net profit as a percentage of assets	1.0582	0.8082	0.1900
Post transition	3.1466	0.6157	0.0000
Log WUI	0.2154	0.0951	0.0230
Post transition * log WUI			
Economic growth	-4.9730	1.0942	0.0000
Lending rate foreign currency	1.7383	0.2650	0.0000
Cons	-17.7123	2.9504	0.0000
Number of obs = 647			
Time variable : Year	Number of groups = 109		
Number of instruments = 16	Obs per group: min = 1		
Wald chi2(7) = 1463.52	Avg = 5.94		
Prob > chi2 = 0.000	Max = 10		

Instruments for first differences equation

GMM-type (missing=0, separate instruments for each period unless collapsed)

L(2/4).Netprofitaspercentageofasse collapsed

L(1/5).lag_total_branch collapsed

Instruments for levels equation Standard

EquityAssetRatio post_transit1 log_WUI Growth LendingRateForeignCurrency _cons

GMM-type (missing=0, separate instruments for each period unless collapsed)

DL.Netprofitaspercentageofasse collapsed. D.lag_total_branch collapsed

Arellano-Bond test for AR(1) in first differences: z = -0.94 Pr > z = 0.348

Arellano-Bond test for AR(2) in first differences: z = -1.72 Pr > z = 0.086

Sargan test of overid. restrictions: chi2(8) = 83.77 Prob > chi2 = 0.000

(Not robust, but not weakened by many instruments.)

Hansen test of overid. restrictions: chi2(8) = 25.69 Prob > chi2 = 0.001

(Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets: GMM instruments for levels

Hansen test excluding group: chi2(6) = 17.48 Prob > chi2 = 0.008

Difference (null H = exogenous): chi2(2) = 8.21 Prob > chi2 = 0.017

gmm(lag_total_branch, collapse lag(15))

Hansen test excluding group: chi2(2) = 3.47 Prob > chi2 = 0.176

Difference (null H = exogenous): chi2(6) = 22.21 Prob > chi2 = 0.001

gmm(Netprofitaspercentageofasse, collapse lag(2 4))

Hansen test excluding group: chi2(4) = 11.48 Prob > chi2 = 0.022

Difference (null H = exogenous): chi2(4) = 14.21 Prob > chi2 = 0.007

iv(EquityAssetRatio post_transit1 log_WUI Growth LendingRateForeignCurrency, eq(level))

Hansen test excluding group: chi2(3) = 5.80 Prob > chi2 = 0.122

Difference (null H = exogenous): chi2(5) = 19.89 Prob > chi2 = 0.001

Source: Authors' elaboration.

Annexe A16: Effect of fragmented world on number of branches: Step 2 interaction effect

Total branch as dependent variable	Coefficient	std. err.	P Value
Lag total branch	-0.00376	0.00528	0.4760
Equity-asset ratio	-0.01921	0.00707	0.0070
Net profit as a percentage of assets	0.90841	0.78650	0.2480
Post transition			
Log WUI			
Post transition * WUI	0.31767	0.06278	0.0000
Economic growth	-4.96723	1.11705	0.0000
Lending rate foreign currency	1.73462	0.27099	0.0000
Cons	-15.45571	2.69060	0.0000
Number of obs = 647			
Time variable : Year	Number of groups = 109		
Number of instruments = 15	Obs per group: min = 1		
Wald chi2(6) = 1274.72	Avg = 5.94		
Prob > chi2 = 0.000	Max = 10		
Instruments for first differences equation			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
L(2/4).Netprofitaspercentageofasse collapsed			
L(1/5).lag_total_branch collapsed			
Instruments for levels equation Standard			
EquityAssetRatio Post_transit1_1_WUI Growth LendingRateForeignCurrency _cons			
GMM-type (missing=0, separate instruments for each period unless collapsed)			
DL.Netprofitaspercentageofasse collapsed. D.lag_total_branch collapsed			
Arellano-Bond test for AR(1) in first differences: z = -0.46 Pr > z = 0.644			
Arellano-Bond test for AR(2) in first differences: z = -2.01 Pr > z = 0.045			
Sargan test of overid. restrictions: chi2(8) = 78.11 Prob > chi2 = 0.000			
(Not robust, but not weakened by many instruments.)			
Hansen test of overid. restrictions: chi2(8) = 25.80 Prob > chi2 = 0.001			
(Robust, but weakened by many instruments.)			
Difference-in-Hansen tests of exogeneity of instrument subsets: GMM instruments for levels			
Hansen test excluding group: chi2(6) = 18.29 Prob > chi2 = 0.006			
Difference (null H = exogenous): chi2(2) = 7.51 Prob > chi2 = 0.023			
gmm(lag_total_branch, collapse lag(1 5))			
Hansen test excluding group: chi2(2) = 2.78 Prob > chi2 = 0.248			
Difference (null H = exogenous): chi2(6) = 23.01 Prob > chi2 = 0.001			
gmm(Netprofitaspercentageofasse, collapse lag(2 4))			
Hansen test excluding group: chi2(4) = 10.79 Prob > chi2 = 0.029			
Difference (null H = exogenous): chi2(4) = 15.01 Prob > chi2 = 0.005			
iv(EquityAssetRatio Post_transit1_1_WUI Growth LendingRateForeignCurrency, eq(level))			
Hansen test excluding group: chi2(4) = 7.95 Prob > chi2 = 0.093			
Difference (null H = exogenous): chi2(4) = 17.85 Prob > chi2 = 0.001			

Source: Authors' elaboration.

Annexe A17: Correlation matrix

	Lag NPL loan	Log asset	Equity~o	Netpr~et	Log_WUI	Growth	Lendin~y	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Lag NPL loan	1																	
Log asset	-0.222	1																
Equity asset ratio	0.131	-0.483	1															
Net profit-asset	-0.191	0.281	0.079	1														
Log WUI	-0.050	0.024	0.029	0.015	1													
Growth	0.044	-0.063	-0.045	0.013	-0.208	1												
Lending rate	0.065	-0.088	-0.064	0.073	-0.375	0.510	1											
2013	0.130	-0.044	-0.014	0.046	-0.205	0.134	0.624	1										
2014	-0.036	-0.013	-0.067	0.065	-0.325	0.149	0.481	-0.049	1									
2015	0.015	-0.032	-0.021	0.043	-0.061	0.116	0.324	-0.057	-0.060	1								
2016	-0.047	-0.059	-0.014	-0.013	0.041	0.198	0.218	-0.068	-0.071	-0.083	1							
2017	-0.049	-0.043	0.022	-0.054	-0.133	0.224	0.010	-0.071	-0.074	-0.087	-0.103	1						
2018	-0.022	-0.013	-0.033	-0.019	-0.087	0.298	-0.088	-0.074	-0.077	-0.090	-0.107	-0.112	1					
2019	-0.001	0.027	-0.001	0.029	0.698	0.222	-0.179	-0.075	-0.078	-0.092	-0.108	-0.114	-0.118	1				
2020	-0.079	0.028	0.025	0.000	0.420	-0.878	-0.337	-0.074	-0.077	-0.091	-0.107	-0.113	-0.117	-0.119	1			
2021	0.013	0.046	0.008	-0.026	-0.488	-0.241	-0.317	-0.074	-0.077	-0.090	-0.107	-0.112	-0.116	-0.118	-0.117	1		
2022	0.036	0.035	0.036	0.027	0.095	-0.053	-0.174	-0.079	-0.082	-0.096	-0.114	-0.120	-0.124	-0.125	-0.125	-0.124	1	
2023	0.066	0.035	0.028	-0.056	-0.138	-0.034	-0.122	-0.079	-0.082	-0.097	-0.114	-0.120	-0.125	-0.126	-0.125	-0.125	-0.133	1

Source: Authors' elaboration.

Note: NPL = Nonperforming Loan; Equity~o = Equity asset ratio; Netpr~et = Net profit-asset; Lendin~y = Lending rate.

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Cambodia Development Resource Institute (CDRI)
Address: #56 Street 315, Tuol Kork, PO Box 622,
Phnom Penh, Cambodia. Postal Code: 12152
Phone: +855 23 881701 +855 23 881916 +855 23 883603
Email: cdri@cdri.org.kh
Website: www.cdri.org.kh

