Bank Merger Policy and Financial Stability in Nepal: Some Empirical Evidences

Submitted by Sagar Gautam (51-228205)

<u>Supervised by</u> Kenichi Ueda Professor

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## Abstract

Stability in the banking system is one of the key policy objectives of the central bank in any country. Consolidation through Merger of Banks was foreseen by Nepal Rastra Bank as one of the means of enhancing stability in the banking system a decade ago. Our research work using weighted panel model attempts to study if the Merger Policy introduced by the central bank of Nepal (NRB) was effective to enhance the stability of the individual financial institutions and the system after the advent of the Merger Policy in Nepal. From our empirical evidence using quarterly data from 2014-2022, a period in which many bank merger took place, it was noted that the Merged banks were significantly more stable than their unmerged counterparts and merger led to more stable banking system. Uniqueness of our research helped to assess the stability issue resulting from consolidation especially from Merger, which is not much studied in prior literature as a determinant of stability and at least not in Nepal. Our result might build some optimism in the policy makers that the policy is at least not doing bad within the extent of our research scope. Side-by-side our findings also helped to provide some evidence for consolidation-stability conundrum often debated in the literature of banking and financial corporations streamlining evidence in support of charter value hypothesis in Nepal.

JEL classification code: E58, G21, G34, G38

Keywords: Stability, Bank Merger, Consolidation, Z-score, Financial Sector Reform program (FSRP).

# **Table of Contents**

Abstract       ii         1. INTRODUCTION       1         1.1. Research Background       1         1.1.1 Brief Introduction to Banking System of Nepal       1         1.1.2 Highlights of Financial Sector Reform in Nepal       2         1.1.3 Context and Rationale of Bank Merger Policy in Nepal       4         1.2 Research Question and Hypothesis       5         2. LITERATURE REVIEW       7         2.1 Merger and Associated School of Thoughts       7         2.2 Rationale (Theories) of Merger       8         2.3 Bank Merger and Stability       9         2.4 Scholarly Works and Research Gap       10         3. DATA AND METHODOLOGY       13         3.1 Data Samples and Measurement       13         3.2 Variables and their sources       13         3.3 Data Cleaning       14         3.4 Methodology and Model Specification       15         4. EMPIRICAL RESULTS AND ANALYSIS       19         4.1 Data Visualization       21         4.3 Diagonostic Test and Robustness       22         4.4 Empirical Result Compared       23         4.5 Result vis-a-vis Field Experience       24         5. DISCUSSION AND CONCLUSION       26         5.1 Conclusion       26         5.2 Li	Ac	knowl	ledgement	i
1. INTRODUCTION       1         1.1. Research Background.       1         1.1.1 Brief Introduction to Banking System of Nepal       1         1.1.2 Highlights of Financial Sector Reform in Nepal       2         1.1.3 Context and Rationale of Bank Merger Policy in Nepal       4         1.2 Research Question and Hypothesis       5         2. LITERATURE REVIEW       7         2.1 Merger and Associated School of Thoughts.       7         2.2 Rationale (Theories) of Merger.       8         2.3 Bank Merger and Stability       9         2.4 Scholarly Works and Research Gap       10         3. DATA AND METHODOLOGY.       13         3.1 Data Samples and Measurement.       13         3.2 Variables and their sources       13         3.3 Data Cleaning.       14         3.4 Methodology and Model Specification.       15         4. EMPIRICAL RESULTS AND ANALYSIS.       19         4.1 Data Visualization       21         4.3 Diagonostic Test and Robustness.       22         4.4 Empirical Result Compared.       23         4.5 Result vis-a-vis Field Experience.       24         5. DISCUSSION AND CONCLUSION.       26         5.1 Conclusion.       26         5.2 Limitation of Study and Future Direction.	Ab	stract.		ii
1.       Introduction       1         1.1.       Research Background.       1         1.1.1.       Brief Introduction to Banking System of Nepal       1         1.1.2.       Highlights of Financial Sector Reform in Nepal       2         1.1.3.       Context and Rationale of Bank Merger Policy in Nepal       4         1.2.       Research Question and Hypothesis       5         2.       LITERATURE REVIEW       7         2.1.       Merger and Associated School of Thoughts.       7         2.1.       Rationale (Theories) of Merger       8         2.3.       Bank Merger and Stability       9         2.4.       Scholarly Works and Research Gap.       10         3.       DATA AND METHODOLOGY.       13         3.1.       Data Samples and Measurement.       13         3.2.       Variables and their sources       13         3.3.       Data Cleaning.       14         3.4.       Methodology and Model Specification.       15         4.       Empirical Result       21         4.3.       Diagonostic Test and Robustness.       22         4.4.       Empirical Result Compared.       23         4.5.       Result Vis-a-vis Field Experience.       24 <th>1</th> <th></th> <th></th> <th>1</th>	1			1
1.1 Research Background	1.			⊥
1.1.1 Brief Introduction to Banking System of Nepal.       1         1.1.2 Highlights of Financial Sector Reform in Nepal.       2         1.1.3 Context and Rationale of Bank Merger Policy in Nepal       4         1.2 Research Question and Hypothesis       5         2. LITERATURE REVIEW       7         2.1 Merger and Associated School of Thoughts       7         2.2 Rationale (Theories) of Merger.       8         2.3 Bank Merger and Stability       9         2.4 Scholarly Works and Research Gap.       10         3. DATA AND METHODOLOGY.       13         3.1 Data Samples and Measurement.       13         3.2 Variables and their sources       13         3.3 Data Cleaning.       14         3.4 Methodology and Model Specification.       15         4. EMPIRICAL RESULTS AND ANALYSIS.       19         4.1 Data Visualization.       19         4.2 Empirical Result.       21         4.3 Diagonostic Test and Robustness.       22         4.4 Empirical Result Compared.       23         4.5 Result vis-a-vis Field Experience.       24         5. DISCUSSION AND CONCLUSION.       26         5.1 Conclusion.       26         5.2 Limitation of Study and Future Direction.       26         5.2 Limitation of Study		1.1	Research Background	L
1.1.2 Highlights of Financial Sector Reform in Nepal.       2         1.1.3 Context and Rationale of Bank Merger Policy in Nepal       4         1.2 Research Question and Hypothesis.       5         2. LITERATURE REVIEW       7         2.1 Merger and Associated School of Thoughts.       7         2.2 Rationale (Theories) of Merger.       8         2.3 Bank Merger and Stability       9         2.4 Scholarly Works and Research Gap.       10         3. DATA AND METHODOLOGY       13         3.1 Data Samples and Measurement.       13         3.2 Variables and their sources       13         3.3 Data Cleaning.       14         3.4 Methodology and Model Specification.       15         4. EMPIRICAL RESULTS AND ANALYSIS.       19         4.1 Data Visualization.       19         4.2 Empirical Result       21         4.3 Diagonostic Test and Robustness.       22         4.4 Empirical Result Compared.       23         4.5 Result vis-a-vis Field Experience.       24         5. DISCUSSION AND CONCLUSION       26         5.1 Conclusion.       26         5.2 Limitation of Study and Future Direction.       26         5.2 Limitation of Study and Future Direction.       26			1.1.1 Brief Introduction to Banking System of Nepal	1
1.1.3 Context and Rationale of Bank Merger Policy in Nepal       4         1.2 Research Question and Hypothesis       5         2. LITERATURE REVIEW       7         2.1 Merger and Associated School of Thoughts       7         2.2 Rationale (Theories) of Merger       8         2.3 Bank Merger and Stability       9         2.4 Scholarly Works and Research Gap       10         3. DATA AND METHODOLOGY       13         3.1 Data Samples and Measurement       13         3.2 Variables and their sources       13         3.3 Data Cleaning       14         3.4 Methodology and Model Specification       15         4 EMPIRICAL RESULTS AND ANALYSIS       19         4.1 Data Visualization       19         4.2 Empirical Result       21         4.3 Diagonostic Test and Robustness       22         4.4 Empirical Result Compared       23         4.5 Result vis-a-vis Field Experience       24         5.1 Conclusion       26         5.2 Limitation of Study and Future Direction       26         5.2 Limitation of Study and Future Direction       26			1.1.2 Highlights of Financial Sector Reform in Nepal	2
1.2 Research Question and Hypothesis.       5         2. LITERATURE REVIEW      7         2.1 Merger and Associated School of Thoughts.      7         2.2 Rationale (Theories) of Merger.      8         2.3 Bank Merger and Stability      9         2.4 Scholarly Works and Research Gap.      10         3. DATA AND METHODOLOGY      13         3.1 Data Samples and Measurement.      13         3.2 Variables and their sources			1.1.3 Context and Rationale of Bank Merger Policy in Nepal	4
2.       LITERATURE REVIEW       7         2.1       Merger and Associated School of Thoughts       7         2.2       Rationale (Theories) of Merger.       8         2.3       Bank Merger and Stability       9         2.4       Scholarly Works and Research Gap.       10         3.       DATA AND METHODOLOGY.       13         3.1       Data Samples and Measurement.       13         3.2       Variables and their sources       13         3.3       Data Cleaning.       14         3.4       Methodology and Model Specification.       15         4.       EMPIRICAL RESULTS AND ANALYSIS       19         4.1       Data Visualization.       19         4.2       Empirical Result       21         4.3       Diagonostic Test and Robustness.       22         4.4       Empirical Result Compared.       23         4.5       Result vis-a-vis Field Experience.       24         5.       DISCUSSION AND CONCLUSION.       26         5.1       Conclusion.       26         5.2       Limitation of Study and Future Direction.       26         7.2       Experiences       28-29		1.2	Research Question and Hypothesis	5
2.1       Merger and Associated School of Thoughts	2.	LITER	RATURE REVIEW	7
2.2 Rationale (Theories) of Merger.       .8         2.3 Bank Merger and Stability       .9         2.4 Scholarly Works and Research Gap.       .10         3. DATA AND METHODOLOGY.       .13         3.1 Data Samples and Measurement.       .13         3.2 Variables and their sources       .13         3.3 Data Cleaning.       .14         3.4 Methodology and Model Specification.       .15         4. EMPIRICAL RESULTS AND ANALYSIS.       .19         4.1 Data Visualization.       .19         4.2 Empirical Result.       .21         4.3 Diagonostic Test and Robustness.       .22         4.4 Empirical Result Compared.       .23         4.5 Result vis-a-vis Field Experience.       .24         5. DISCUSSION AND CONCLUSION.       .26         5.1 Conclusion.       .26         5.2 Limitation of Study and Future Direction.       .26         8.4 EFEFENCES.       .28-29		2.1	Merger and Associated School of Thoughts	7
2.3 Bank Merger and Stability       .9         2.4 Scholarly Works and Research Gap.       .10         3. DATA AND METHODOLOGY       .13         3.1 Data Samples and Measurement.       .13         3.2 Variables and their sources       .13         3.3 Data Cleaning.       .14         3.4 Methodology and Model Specification.       .15         4. EMPIRICAL RESULTS AND ANALYSIS.       .19         4.1 Data Visualization.       .19         4.2 Empirical Result.       .21         4.3 Diagonostic Test and Robustness.       .22         4.4 Empirical Result Compared.       .23         4.5 Result vis-a-vis Field Experience.       .24         5. DISCUSSION AND CONCLUSION.       .26         5.1 Conclusion.       .26         5.2 Limitation of Study and Future Direction.       .26         8.2 EFERENCES.       .28-29		2.2	Rationale (Theories) of Merger	8
2.4 Scholarly Works and Research Gap.103. DATA AND METHODOLOGY133.1 Data Samples and Measurement.133.2 Variables and their sources133.3 Data Cleaning.143.4 Methodology and Model Specification.154. EMPIRICAL RESULTS AND ANALYSIS.194.1 Data Visualization.194.2 Empirical Result.214.3 Diagonostic Test and Robustness.224.4 Empirical Result Compared.234.5 Result vis-a-vis Field Experience.245. DISCUSSION AND CONCLUSION.265.1 Conclusion.265.2 Limitation of Study and Future Direction.26REFERENCES.28-29		2.3	Bank Merger and Stability	9
3. DATA AND METHODOLOGY       13         3.1 Data Samples and Measurement       13         3.2 Variables and their sources       13         3.3 Data Cleaning       14         3.4 Methodology and Model Specification       15         4. EMPIRICAL RESULTS AND ANALYSIS       19         4.1 Data Visualization       19         4.2 Empirical Result       21         4.3 Diagonostic Test and Robustness       22         4.4 Empirical Result Compared       23         4.5 Result vis-a-vis Field Experience       24         5. DISCUSSION AND CONCLUSION       26         5.1 Conclusion       26         5.2 Limitation of Study and Future Direction       26         7.2 REFERENCES       28-29		2.4	Scholarly Works and Research Gap	10
3.1 Data Samples and Measurement.       .13         3.2 Variables and their sources       .13         3.3 Data Cleaning.       .14         3.4 Methodology and Model Specification.       .15         4. EMPIRICAL RESULTS AND ANALYSIS.       .19         4.1 Data Visualization.       .19         4.2 Empirical Result.       .21         4.3 Diagonostic Test and Robustness.       .22         4.4 Empirical Result Compared.       .23         4.5 Result vis-a-vis Field Experience.       .24         5. DISCUSSION AND CONCLUSION.       .26         5.1 Conclusion.       .26         5.2 Limitation of Study and Future Direction.       .26         8.2 REFERENCES.       .28-29	3.	DATA	A AND METHODOLOGY	13
3.2       Variables and their sources       13         3.3       Data Cleaning       14         3.4       Methodology and Model Specification       15         4.       EMPIRICAL RESULTS AND ANALYSIS       19         4.1       Data Visualization       19         4.2       Empirical Result       21         4.3       Diagonostic Test and Robustness       22         4.4       Empirical Result Compared       23         4.5       Result vis-a-vis Field Experience       24         5.       DISCUSSION AND CONCLUSION       26         5.1       Conclusion       26         5.2       Limitation of Study and Future Direction       26         7.2       REFERENCES       28-29		3.1	Data Samples and Measurement	13
3.3 Data Cleaning.143.4 Methodology and Model Specification.154. EMPIRICAL RESULTS AND ANALYSIS.194.1 Data Visualization.194.2 Empirical Result.214.3 Diagonostic Test and Robustness.224.4 Empirical Result Compared.234.5 Result vis-a-vis Field Experience.245. DISCUSSION AND CONCLUSION.265.1 Conclusion.265.2 Limitation of Study and Future Direction.26REFERENCES.28-29		3.2	Variables and their sources	13
3.4 Methodology and Model Specification       15         4. EMPIRICAL RESULTS AND ANALYSIS       19         4.1 Data Visualization       19         4.2 Empirical Result       21         4.3 Diagonostic Test and Robustness       22         4.4 Empirical Result Compared       23         4.5 Result vis-a-vis Field Experience       24         5. DISCUSSION AND CONCLUSION       26         5.1 Conclusion       26         5.2 Limitation of Study and Future Direction       26         7.8 REFERENCES       28-29		3.3	Data Cleaning	14
4. EMPIRICAL RESULTS AND ANALYSIS.       19         4.1 Data Visualization.       19         4.2 Empirical Result.       21         4.3 Diagonostic Test and Robustness.       22         4.4 Empirical Result Compared.       23         4.5 Result vis-a-vis Field Experience.       24         5. DISCUSSION AND CONCLUSION.       26         5.1 Conclusion.       26         5.2 Limitation of Study and Future Direction.       26         7.8 EFERENCES.       28-29		3.4	Methodology and Model Specification	15
4.1 Data Visualization.194.2 Empirical Result.214.3 Diagonostic Test and Robustness.224.4 Empirical Result Compared.234.5 Result vis-a-vis Field Experience.245. DISCUSSION AND CONCLUSION.265.1 Conclusion.265.2 Limitation of Study and Future Direction.267.8 REFERENCES.28-29	4.	EMP	IRICAL RESULTS AND ANALYSIS	19
4.2 Empirical Result		4.1	Data Visualization	19
4.3 Diagonostic Test and Robustness.       22         4.4 Empirical Result Compared.       23         4.5 Result vis-a-vis Field Experience.       24         5. DISCUSSION AND CONCLUSION.       26         5.1 Conclusion.       26         5.2 Limitation of Study and Future Direction.       26         REFERENCES		4.2	Empirical Result	21
4.4 Empirical Result Compared		4.3	Diagonostic Test and Robustness	22
4.5 Result vis-a-vis Field Experience		4.4	Empirical Result Compared	23
<ul> <li>5. DISCUSSION AND CONCLUSION</li></ul>		4.5	Result vis-a-vis Field Experience	24
5.1 Conclusion	5.	DISC		26
5.2 Limitation of Study and Future Direction		5.1	Conclusion	26
REFERENCES		5.2	Limitation of Study and Future Direction	26
	RFI	FRFN	ICES	28-29

## **1. INTRODUCTION**

## 1.1 Research Background

#### 1.1.1 Brief Introduction to Banking System in Nepal

Financial System has a broader scope. Nepal's Financial system comprise of Financial Institutions regulated by the Central bank and other contractual saving institutions. Financial institutions such as Commercial Banks, Development Banks, Finance Companies and Micro Finance are regulated and supervised by the Central Bank (hereafter referred to Nepal Rastra Bank abbreviated as NRB). Some other types of institutions apart from those regulated by NRB include cooperatives providing some financial services among their members for their socio-economic needs. Other Institutions include contractual saving institutions like Insurance companies, Reinsurance companies, Citizen Investment Trust, Employee Provident Fund, Social Security Fund etc. which are outside the regulatory jurisdiction of NRB.



Source: Author's compilation (Data from Nepal Financial Stability Report 2022)

The chart above shows that the 5 categories of Financial Institutions regulated by NRB hold around 80 percent of the total asset of the financial system with commercial banks solely holding around 85 percent of the assets of those supervised banking system (FSR Nepal, 2022). The chart clearly highlights the role of NRB regulated financial institutions in Nepalese economy. Thus, any policy move made by the Central Bank within its jurisdiction is supposed to affect the growth and stability of the banking institutions individually and to the system.

The chart above helps us understand the relative importance of the banking institutions existing currently in Nepal in terms of their size (as mentioned in the pie chart earlier) and functionality of those institutions along with their key characteristics as mentioned in Bank and Financial Institution Act- 2017 (unified Act guiding the banking system in Nepal regulated by the central bank of Nepal) has been summarized and presented in the following table-1.

There are 5 types of BFIs as envisaged in BAFIA-2017 based on capital size and functionality with their branches expanding either locally or nationally. We have presented below the types of banks existing in Nepal regulated by the central bank, their key functions, and features in the table below.

Type of Banking Institutions	Functions (As mentioned in Bank and Fin. Inst. Act 2017)	Features
(Regulated by the Central Bank)		
Micro Finance Institution (MFIs)	Allows micro deposit/lending among the	Small sized, source of fund is equity and
	members/shareholders only	deposit from members, asset 7.1%
Commercial Banks	All financial functions like deposit, lending, remittance, LC,	Largest size (capital), source of fund is
	forex transaction etc.	customer deposit, asset portion 82.2 %
Development Banks	All functions by commercial banks except foreign remit,	Capital size less than commercial banks
	hypothecation etc	
Finance Companies (FCs) Deposit, lending, and mainly hire purchase and leasing		Less capital than Development banks
	finance.	
NIFRA	National level Infrastructure and project financing institution	Specifically established for project
		financing, maximum initial capital Rs.20
		billion from equity

Table 1: Types of BFIs in Nepal

Source: Author compilation from BAFIA-2017

One of the interesting differences between the banking institutions in Nepal from that of other countries is that despite various classes/categories of banks in Nepal, all of them are engaged in deposit-lending business but at various capacity.

## 1.1.2 Highlights on Financial Sector Reform in Nepal

Nepal is a country of High Himalayas located in South Asia with a GDP per capita of US\$ 1281 (in 2022). It is scheduled to be graduated from LDC in 2026<sup>1</sup>. Despite the small size of its economy, Nepal has a relatively diversified finance sector. Before reaching its current state, the finance sector went through two major reform which will be discussed briefly below.

**Prior to 1985**, economic policies were centered on state-led protectionist strategies where government controlled the exchange rate and restricted the quantity of foreign exchange, controlled import licensing, imposed high import tariffs, overvaluation of the domestic currency, and adopted direct price control which severely constrained export growth and negatively affected industrial growth. Due to these **government controls and protectionist approach** intermingled with structural rigidity, slow economic growth, and state-led policy distortions in the economy, the government faced unprecedented budgetary deficit in parallel with current account deficit which slowly deepened fiscal and economic crisis since late 1970s. Till 1985, government expenditure rose heavily, revenue increased marginally, public debt rose to around 40 percent of the GDP. The high public debt led to insufficient commercial credit availability and limited private sector growth. The fiscal problems contributed to high inflation and a worsening current account balance (Ozaki, 2014). Likewise Financial sector was not untouched by the above issues. The financial sector was dominated by two bank (RBB and NBL) accounting for more than 70% of total assets in the finance sector. Being state-owned, these

<sup>&</sup>lt;sup>1</sup> As per UN General Assembly Resolution dated 11 November 2021, Nepal will graduate from LDCs in 2026

banks had serious portfolio problems due to the government intervention (Adhikari et al., 2007). Scenario was more aggravated by the weak supervisory system of NRB. The deepening economic and financial crisis compelled the government to seek help from international donors.

In **1985** (2042 B.S as per Nepali date system), the government entered into its first stand-by credit agreements with the International Monetary Fund (IMF)and initiated reforms under the **Economic Stabilization Program**. In the same year, the government signed an agreement with the World Bank for the **Structural Adjustment Program (SAP)**. The key focus of SAP was market-oriented reforms to reduce government interventions in the economy including concrete targets concerning fiscal austerity, privatisation, trade liberalisation, currency devaluation, government expenditure reduction strategy and deregulation. They can be collectively understood as reforms for Liberalization of the economy. SAP had two phases: SAP I (1986–1989) and SAP II (1989–1992). **Financial Sector Reform was implemented under SAP II**. The major goal of FSRP was to correct serious portfolio problems of RBB and NBL (two major banks then existing) and strengthen their financial and operational performances. The reform also aimed to strengthen NRB's capacity to improve the finance sector's legal and regulatory environment.

**First Financial Sector Reform** mainly focused on various legistative reforms (amendment of commercial bank Act, NRB Act etc.), infrastructural changes, technical assistance to NRB to improve bank supervision and inspection functions, establishment of other financial institutions like NIDC, CIT and Credit Information Bureau. The liberalization helped private sector entry and rapid financial sector expansion which was much needed that time. The number of commercial banks grew from 3 in 1985 to 14 in 2000. During the period, annual credit expansion was above 50 percent and access to banking service measured in terms of population per branch improved significantly.

With the first Financial Sector Reform, the growth of commercial banks took place, financial deepening and credit growth accelerated. However, **full phase of financial reforms was still due**. Dominance of state-owned financial institutions continued, and the poor performance of state-owned institutions posed a serious risk to the sector. World Bank and IMF in 1999 conducted **Financial Sector Assessment Program (FSAP)** in Nepal to identify the vulnerabilities in the financial system in Nepal. In **2000**, **Financial Sector Reform Strategic Paper (FSRSP)** was announced by the government in accordance with FSAP to conduct a series of financial reforms in the central bank and other financial institutions including state-owned-banks.

Thus, **Second Financial Sector Reform** was initiated in Nepal which include 2 phases of reform comprising mainly the re-engineering, and restructuring of NRB, RBBL and NBL. *Phase I - Financial* 

3

Sector Technical Assistance Project (FSTAP) to re-engineering of NRB (phase I), restructuring of NBL and RBBL and Capacity Building in the Financial Sector (Implemented on 2003-2007). Phase II -Financial Sector Restructuring Project (FSRP) comprising of VRS in RBBL, NBL, Phase II re-engineering of NRB, ongoing management support in RBBL and NBL (Implemented on 2004-2009).

#### **Context and Rationale of Bank Merger Policy in Nepal** 1.1.3

The financial sector in Nepal experienced significant reforms following liberalization in 1985 as discussed earlier, leading to increased financial deepening and credit growth due to the proliferation of banks and branches. However, this expansion also brought about challenges, including the emergence of underperforming banks, excessive liquidity, high operating expenses, and mismanagement, as highlighted by the International Monetary Fund (IMF). Many banks had insufficient capital, faced liquidity issues, or were on the verge of closure due to inefficiencies and unhealthy competition (Chalise, 2017).

Additionally, Nepal's membership in the World Trade Organization (WTO) mandated an increase in bank paid-up capital by 2010, further exacerbating the situation (Gurung, 2013). To address these issues, the Nepal Rastra Bank (NRB) advised maintaining the specified level of paid-up capital by 2070 BS. International Monetary Fund (IMF) also suggested narrowing down the number of financial institutions nearly to 100 during that period.

Thus, Merger of Banks was taken as an ideal means of responding to all these issues and coping new opportunities and thereby re-establishing their competitive advantages in Nepal banking sector. NRB came up with Merger Bylaw -2011 (amended later in 2016 as Merger and Acquisition Bylaw) with 4 major objectives viz. to boost public confidence in the financial system, enhance stability of the financial system, strengthen bank capital position and competitiveness, and protect the interest of depositors in the financial system.



#### Chart 2 : Bank Merger in Nepal: Figures from 2010-2021

us of various classes of BFIs resulting from Merger

Source: Merger unit, BFIRD, NRB (as on early 2022)

The graph above depicts the picture of Merger of BFIs in Nepal from 2010 to 2021. We can find that numerous merger of banks took place and this phenomenon helped to reduce the number of banks significantly in Nepal. Merger taking place during this period resulted in 52 BFIs from 213 BFIs involved where 161 BFIs were non existing from the Merger process. Thus, after more than a decade of Merger process/policy, we are interested to assess the impact of the policy itself by taking the data samples around the same period where maximum bank merger took place in Nepal.

## **1.2 Research Question and Hypothesis**

After the Merger Policy introduced in Nepal in 2011 (and its amendment in 2016), many banks opt for Merger as a strategic or voluntary choice, the policy which was togetherly supported with some incentives for Merged banks through the Monetary policy announced in the subsequent years. One of the major objective of the Central bank behind the introduction of the Merger Policy in the banking sector is to enhance the Financial Stability.

From the research background mentioned above, this research will mainly focus on wheather the Bank Merger Policy in Nepal helped enhance the stability of the banks or financial stability as a whole which was one of the key objective of the Merger Policy introduced in Nepal in 2011. Here are few **research questions** attempted to be addressed in this study:

**Key Question**: Has the Bank Merger/policy help enhance the Stability of the Merged Banking Institutions in Nepal ?

Sub-question: Did the Merger Policy in BFIs help enhance the Financial Stability in Nepal?

In this context, we need to understand that sum of the individual bank stability may not be equal to Financial/ Banking system stability as a whole due to Contagion effect / or interconnectedness in the financial system. However, a general understanding of financial stability can be made from the assessment of individual bank stability. So, we suppose that answer to our key question gives some sort of resolution to our sub question too which we will try to explain in the finding section.

Economic theory offers little policy guidance for the issue of Merger, and its effectiveness. The impact of Bank Merger on stability is at times a debated issue but not being able to conclude much. There are two mutually contradicting hypothesis (*charter-value hypothesis* and *competition-stability hypothesis*) to explain the impact of Bank Merger and its impact in the stability (Berger et al., 2017). Also, even though not within this research, but we are interested to oversee if Merged institutions are cost efficient as cost efficiency is one of the major goal behind Merger of any institutions<sup>2</sup> in the future

<sup>&</sup>lt;sup>2</sup> Explained by the Efficiency theory of Merger (Kai Du et al., 2016)

research work with appropriate methodology. These theoritical aspects presumed in the research question which will be discussed briefly in the literature review section later.

To these question, we opt for a panel regression model (Fixed Effect) to empirically assess the impact of Merger in stability of the Banks and try to explain the reason behind any differences in result from various forms of analysis. The approach will be further explained in the methodology section in detail.

#### 2. LITERATURE REVIEW

#### 2.1 Merger and Associated School of Thoughts

Merger can be understood as the legal union of two or more business entities into one choosen as a strategic option for various motives which is a widely adopted means of consolidation in various economic sectors including banks. Further, the "merger movement" in banking has been widely documented and debated in policy reports and research papers viz. Boyd and Graham (1991, 1996), Berger, Kashyap and Scalise (1995), Dermine (2000), ECB (2000), OECD (2000), Group of Ten (2001) and many other recent papers too (Carlette et al., 2002).

Merger and Acquisition as a form of consolidation comes broadly under the scope of antitrust regulation. In the United States, the history and story of Merger dates back to 1890 when **Sherman Act w**as enacted, prohibited contracts, and collusions in restraint of trade, giving federal judges the power to draw lines between acceptable cooperation (including Merger) and illegal collusion. **Antitrust enforcement** institutions like Department of Justice, the FTC, and regulatory authorities of Banks, Insurance, Manufacturer etc. aimed at enhancing the consumer welfare in terms of lower prices, increased innovation, and improved product quality etc.

After that, Federal Judges developed principles considering factors such as the impact on competition, market share, efficiency justifications (cost reductions, improved product quality), and non-efficiency goals (public interest, consumer welfare, or social benefits) in determining whether collaboration is anti-competitive or pro-competitive to distinguish between collaboration that suppressed rivalry and cooperation that promoted growth, recognizing that prohibiting all agreements curbing commercial freedom could hinder beneficial forms of cooperation (Kovacic & Shapiro, 2000). That is why Economic analysis and Empirical evidence play a crucial role in evaluating efficiency justifications and non-efficiency goals, providing insights into the competitive effects of antitrust enforcement including Merger. Eventhough monopoly was supposed to be highly discouraged by the Sherman Antitrust Act, subsequent wave of Merger (period 1895-1905) in various forms like verticle mergers, conglomerate mergers, hostile mergers, cross border mergers etc were noted in the United States provided that collusion (Mergers) were supposed to enhance competitive pricing actions, new product development, or new investments (Crandall & Winston, 2002).

It is worth to highlight Harvard School, Chicago School of Thoughts and the following ones as a diverse (at times conflicting too) viewpoint to antitrust analysis. **Harvard School** of thought dominant during the preliminary phase of antitrust enforcement in USA emphasized the *per se rule* (market share

7

presumption of illegality of the collusion or merger), which categorically condemned certain types of conduct as anticompetitive without considering their actual effects to lower costs or prices or benefit consumers (Kovacic W.E, 2021). However, Advocate of the laissez-faire economy, the **Chicago School** of thought set Consumer Welfare Standard of Merger (collusion), viewing no evil in market power per se as dominant firms may be more efficient as long as consumers will enjoy the benefits of Merger. According to the consumer welfare standard decision framework, if consumers are harmed, the business practice or transaction should be blocked; otherwise, it is totally fine and should not be impeded by the state. Consumer welfare is said to be attained if a producer raises output level, lowers prices, or boost the quality of goods or services provided relative to the baseline that benefits the consumer.

In 2010, **New Brandeisian School** of thoughts started to question the foundations of the Chicago School for its over emphasis on consumer welfare standard in allowing too many mergers and acquisitions to proceed. Thus, advocating that not only consumer welfare in terms of price and output but broader criteria (overall welfare) including the impact of corporate consolidation on the labor market, underserved communities, and racial equity, economic inequality, worker rights, innovation, and the overall health of democratic institutions are to be considered in antitrust laws and enforcement. Now, the Antitrust agencies in the USA are considering to incorporate the good features of all these school of thoughts in their endeavor.

## 2.2 Rationale (Theories) of Merger

There are several theoritical perspectives that explains the motive behind Merger and Acquisition. For the sake of ease, we have taken the term Merrger, Acquisition and similar modes of firm's consolidation interchangeably. From the theoritical viewpoint, following table highlights the motives of Merger:

Origin of Merger			Theories	Description (Rationale)
Merger as a rational choice	Merger benefits	Net gain through synergy	Efficiency Theory	Exploiting financial, operational,
	bidder's			managerial synergies, stability
	shareholders			goals etc.
		Wealth transfers from	Monopoly Theory	Achieving Market Power
		Monopoly theory customers		
		Wealth transfers from	Raider Theory	Activities of Corporate Raiders
		target's shareholders		
		Net gains through private	Valuation Theory	Exploiting information
		information		asymmetries between the
				acquirer and the public
	Merger benefits		Empire Building	Managers' personal benefits
	managers		Theory/Agency Theory	rather than shareholder value

Table 2: Motives of Merger

Merger as a process outcome	Process Theory	Strategic decision processes
		leading to (and after) the merger
Merger as a macroeconomic	Disturbance Theory	Mergers as a consequence of
phenomenon		economic disturbances
Source: Trautwein (1990)		

According to *Efficiency theory*, Merger is a planned process to achieve the synergy or any sorts of efficiency which is attained from cost reduction or increasing sales. To test the efficiency, Event study is done to assess the pre and post-merger financial performance of the merging and merged entities (Bacon et al., 2022). According to *Valuation Theory*, the shareholder adopt merger if they have some confidential information prior to the market participants about the target institution to manipulate it for their gains from the Merger. According to *Empire building Theory*, the top management and directors of any institution opt to merger for shareholder value maximization from market expansion. *Agency Theory* states that the agents of any institution (Top management, BOD) choose for merger for agency gains above the shareholders' interest. According to Disturbance Theory, Merger is chosen to resolve the impact of uncertainties in the economy to the institution specific. Efficiency theory and Process theory can explain the motives behind the Merger objectives considered in our study.

## 2.3 Bank Merger and Stability

Bank Merger is a widely adopted means of consolidation in the financial sector (banking industry). Consolidation, "too-big-to-fail" issues, banking competition, Merger and Stability concerns has been at the center of banking sector policy debates since long ago (Thorsten Beck, 2008). The global financial crisis of 2007/2008 directed the attention of investors, policymakers, and governments toward the financial stability of the financial sector (Chai et al.,2022).

Financial stability and Individual bank stability are related terms. Financial Stability is defined as the *absence of system-wide episodes* in which the financial system fails to function (crises), a system that has better *resilence to stress*, capable of efficiently allocating resources, assessing, and managing financial risks that could *absorb shock* via self-correcting mechanism and control risks (WB, 2016). It is defined as the ability of the financial system to facilitate and enhance economic processes, manage risks, and absorb shocks (IMF, 2005). In a firm specific level, we can understand stability as strength of an individual bank to operate efficiently, manage risks, resilience to shock (stress), ensure soundness (in terms of CAMELS criteria), avoid solvency risks with available capital and return (profitability). A common measure of stability at an individual bank level is **z-score** which explicitly compares buffers (capitalization and returns) with risk (volatility of returns) to measure a bank's solvency risk (WB, 2016). Even though pertaining to the greater interconnectedness of the institutions and high chance of contagious of one bank failure to next, it is not a best way to assess the financial

stability from the aggregate of individual bank stability measure. However, a general understanding of financial stability can be made from the assessment of individual bank stability.

In this context, it might be interesting to describe a short transmission mechanism depicting stabilityconsolidation transmission pathway in terms of two widely debated hypothesis viz. Competitionstability and Competition-Fragility hypothesis.

## 1. Competition-stability Hypothesis

- Consolidation > likely less competition > high interest rate > moral hazards problem & more NPL (default)
- Likely to lower stability.
- Lower lending rate > increases chances of repayment > also lowering adverse selection (due to enhanced customer base)
- 2. Competition-Fragility Hypothesis (Traditional or classical concept)
- Consolidation (likely reduces competition) > higher market power (monopolization pathway) >
  less likely to overall risks exposure/ less prone to market related vulnerabilities.
- Likely to increase stability.
- Competition has negative impact on charter value of banks > forcing them to take more risk to recover lost profit > lowers stability.

Some recent paper presumes the **Competition-Stability relation** moderated by capitalization issue (U-shape relation) (Risfandy et al., 2020). After the empirical analysis, we can better answer our key question and find out which of the above pathway is more pronounced in Nepal from the empirical assessment. This helps us to compare our results with empirical results from other prior papers/authors and link our results to the field experience of the result of the Merger policy in Nepal.

## 2.4 Scholarly Works and Research Gap

As we have already shed light on the increasing trend of scholarly works in the field of Bank Merger, acquisition, and consolidation, lets discuss in brief about their contribution so far.

Several papers use Z-score as a measure of bank stability in which z-score is defined as  $z \equiv (k+\mu)/\sigma$ , where k is capital to asset ratio expressed in percent,  $\mu$  is return on asset, and  $\sigma$  is standard deviation of return on assets as a proxy for return volatility (WB, 2016). It indicates the number of standard deviation bank's return on asset must fall before a bank becomes insolvent. The popularity of z-score as a measure of stability comes from the fact that it has clear negative relationship between institution's probability of insolvency i.e. higher z-score implies lower chances of insolvency. It has

computational simplicity and can be used to assess the stability of the institutions for which more advanced market related data are not available. The drawback of this approach includes the use of purely accounting data means of stability and inability to consider interconnectedness and contagion risks of the banking system and its inability to incorporate Macroprudential monitoring Framework for detecting banking crisis. Works from Boyd and Runkle (1993), Beck, Demirguc-Kunt, Levine (2007), Demirguc-Kunt, Detragiache, and Tressel (2008), Laeven and Levine (2009), Cihak and Hesse (2010) use this index as a measure of stability in the banks.

Chai et al., (2022) studied bank-specific risks and the financial stability in Pakistan using fixed effect model and found that Credit and liquidity risk are harmful to bank stability while funding risk has not significant impact. After GFC 2008 and recent covid-19 crisis, studies have identified several determinants of bank and financial stability like Bank Size (Adusei, 2015), corporate governance (Shubhani et al., 2021), market concentration (Barra et al., 2019), Bank Market structure and Financial Inclusion (Feghali et al., 2021) and so on. In this context, assessing the impact of bank Merger in stability is not much studied. Cihak et al., (2010) using regression model with data from 19 countries studied the impact of presence of Islamic banks (dummy variable) in the financial stability and found that small Islamic banks tend to be financially stronger than small commercial banks and vice-versa, small Islamic banks tend to be financially stronger than large Islamic banks, which possibly may reflect poor credit management challenges in larger Islamic banks. In a study of rural banking in Ghana it was identified that larger banks are more stable with more funding risk (Adusei, 2015).

Some literatures do exist to explain the aspect of Bank consolidation, market power, competition, and stability. Strahan and Weston (1996) found that after the merger of small US banks in 1990s, their post-merger small business lending was higher than before while the change for larger banks were insignificant (BIS, 2002). Also, finding that increased market concentration (including from that of Merger) and consolidation tend to drive up the loan rates due to augmented market power. Some studies suggest that more consolidated banking sector are more stable, while other suggest the opposite (that with consolidation worsens too-big-to-fail problems, complicates monitoring in agency problems, and causing organizational diseconomies).

GC (2016) conducted a study of 26 commercial banks in Nepal within the period of 1999-2012 and found that increased bank competition in terms of Herfindahl Hirschman Index (HHI) and n-bank concentration ratio led to more stable banks (z-score) confirming competition-stability hypothesis. Recently, another study using data from 2014-2019 using 6 commercial banks in Nepal conclude that bank competition is negatively associated with bank stability supporting competition-stability

11

hypothesis (Khanal, 2024). Research studying the impact of Merger in operating performance in banking sector are common in Nepal but that assessing the impact of consolidation in Stability are very few. In terms of variables, mostly the use of HHI and n-bank concentration to define or explain the market power of concentration is noted but our research uses Merger as an explanatory variable. Further, those assessing specifically the impact of Merger in stability is rare. Most of them employ prepost performance analysis of a group of banks. Studying the impact in individual merged banks over stability of those bank are further rare in terms of methodology and outcome.

In the review of literature above, studies that consider the impact of Merger in the bank stability and financial stability (of the whole banking system) is lacking. There is no clear cut consensus among the studies in terms of studies of consolidation and stability in terms of outcome and methodology. This paper tries to **extend prior literature** on the impact of bank merger as a proxy of bank consolidation on financial stability using a single country setting in which very few studies have been done. Further, studies focusing a single country setting has come up with ambiguous results while that of cross country analysis has shown positive relationship between competition and stability (Beck, 2008). We want to see wheather Charter-value or Competition-stability hypothesis would explain the stability in Nepalese Banking Industry that was prior not much researched. Further, we are **trying to fill the gap** in existing literature by attempting to study how the consolidation explicitly arising from Merger of a bank affect its stability and assess if the merger policy of adopted by the central bank in Nepal help improve the stability in the banking system.

## 3. DATA AND METHODOLOGY

In this section we will discuss about the the data and methodology used for addressing the research questions and testing the hypotheses stated earlier section of the paper.

## 3.1 Data Samples and Measurement

This paper uses balanced panel data of 30 commercial banks in Nepal from the period 2071 (Q4) to 2079 (Q1) as per Nepali calender date system. It corresponds to data from July 2014 to October 2022. Data for 9 years (30 quarters) are taken for the purpose of our study. The time period specifically choosen represents the period when the merger wave started in Nepal and took a considerable pace after the introduction of the Merger Policy in Nepal in 2011 and its subsequest amendment in 2016. Earlier studies that use similar length of time to study the similar kind of issue include paper that from Abbas et al. (2014), Al-Sharkas et al.(2008) and Yener & Ibanez (2004). Our data has been compiled from several sources like the financial statement disclosed in a quarterly basis from the individual banks, Key Financial Indicators of commercial banks, Monthly statistics, Annual Reports of Bank Supervision, Financial Stability Report which are available either on monthly, quarterly or annual basis from the website of the central bank. At times, data are also extracted from the Global Financial Development database of the world bank.

## 3.2 Variables and their sources

Our dependent variable is Z- score which is constructed and used to measure Bank Stability. We have already defined Z-score in the earlier section of our paper.

Mathematically,  $Z - Score = (k+\mu)/\sigma$ , where k is capital to asset ratio expressed in percent,  $\mu$  is return on asset, and  $\sigma$  is standard deviation of return on assets as a proxy for return volatility.

To measure the cost efficiency (sub question), our next dependent variable will be Base Rate. It measures the overall cost efficiency of a bank. Both of these dependent variable are thus selected anticipating to test the efficiency theory of Merger.

Variables	Code	Defination	Features	Source	Expected
					sign
Bank Stability	z- score	Number of standard deviation a bank's return to fall before it gets insolvent	Accounting figure, computational ease, useful to calculate stability in a system where complex data for other economic interconectedness is not available	Author's Calculation based on panel data constructed/compiled	Positive
Bank Consolidation (Merger)	MR	A bank unites with another to operate as a single entity.	Various motives. In our study, Merger is expected to occur for better bank stability.	Annual reports of various banks	0-1

Table 3: Variables used in our work & their features

To elaborate more about the calculation of z-score, we use return on asset and capital to asset from the quarterly financial report of all 30 banks and compiled it together to get an aggregate panel. Volatility of return is calculated from full period method. If the merger occurred during the initial phase of the sample time period, the window is extended for 8-12 quarters ahead for a particular banks to consider for adequate time period to capture the volatility of the return. Beck and Laeven (2006) and Hesse and Cihak (2007) estimate a Z-score measure that combines ROA<sub>t</sub> and Eq/TA<sub>t</sub> with the SD of ROA calculated over the full period ( $\sigma$ ROA<sub>t</sub>). It was further identified that best measure for calculating the Z-score is the one that combines current ROA and capitalization values with the SD of ROA calculated over the full period (Moreno at el., 2021). Period length varies in literatures and there is no universal concensus. At least the period to be appropriate to capture the change in risk profile of the banks (Malone et al., 2016). Full sample period to calculate sd(ROA) while calculating z-score was identified as the most appropriate method (Moreno et al., 2021). Therefore, we also try to use full period method in our study as well.

## 3.3 Data Cleaning

Lets discuss briefly about our data cleaning process. First, data was compiled in excel format. Ten variables (column) included are Bank name, Bank ID, Time, Capital, Asset, Net Profit, Return on Asset (ROA), Capital to asset ratio, Z-score and merged respectively from the first to last column. They are named in the first row. Values (points) for Z-score is calculated (author's calculation) at the end after filling up the values for all other variables. Second, the Process flow involves the following steps almost in the order mentioned below.

- ✓ Filling data points,
- ✓ sorting as per ID and Time,
- ✓ calculating required variable column (ROA) and z-score, (calculated as per the best module prescribed in the prior literature )
- ✓ Finalizing Panel
- ✓ Running required panel regression in R

Process involves filling each data points/observations from various sources as mentioned in earlier section (data samples and sources section) and sorting them (all dates in ascending order for each ID) as appropriate. After that we calculated ROA (Profit divided by asset), standard deviation of ROA (full sample period) for each bank (ID). From the second row, we started to fill up the data (values) for each variable. All data points are filled and compiled for each quarter obtained from monthly banking and financial statistics (NRB website). After obtaining data for all quarter for all banks, they are sorted

based on ID starting from 1,2,3....30. Finally, bank ID were available in ascending order from 1 to 30. After this, we arranged ascending order for time (Time column) value for each ID. For each bank, if a particular bank is merged with other bank, we assign value 1 after Merger for those bank that participated in Merger, else 0 before merger. For non-Merged banks, all values (column) for all time period are filled and calculated as it is available in the published data set , Merged column is assigned 0 always. For Merged banks, we adopt a strategy to allot same ROA and capital to asset (%) after merger to each of the 2 banks that Merged with each other. This is because after Merger only one entity exist from two. To make panel data balanced, we continue to exist both of the banks but with same value for ROA and capital-to-asset ratio (as both banks are single legal entity). Z-score was calculated as denoted in the formula for each bank and each time period. Thus, we complete our panel set and run the panel regression in Time Fixed Effect (Two-way), also considering their weights and further looking for log transformation model too.

## 3.4 Methodology and Model Specification

We used balanced panel data of all 30 commercial banks of Nepal to study if Merged banks are more stable than those not going into Merger within the time period considered in our sample. Panel regression model in various forms viz. pooled, and other static models (Fixed effect) is used. More specifically, we have choosen *Two-way Fixed Effect* Model to assess our research question as this model controls for bank specific and time specific features that affects the outcome variable (Z-score) in our study. Fixed effects model is used to address the issue of unobserved heterogeneity among individuals or entities over time. In the fixed effects model, individual-specific effects and time factors are treated as fixed parameters. This means that the model controls for all time-invariant individual-specific characteristics that may affect the dependent variable. We have used *R-software* for our empirical assesement and relevant tests.

Dummy variable (MR) is employed as our independent variable to assess its impact on bank stability. Its value is assigned one for a bank after the Merger and for the period before Merger and those banks that never opt for Merger is assigned as zero. We are trying to use only one explainatory variable here in our study with an expectation of better model interpretability, reducing the risk of overfitting, increasing the statistical power to focus on our research question (detecting a true effect when it exists), and enhancing the stability of our estimates (which otherwise may exist due to multicollinearity in case of use of multiple controls). Also, weighted panel regression and logged model is used expecting that these could adjust for heteroscedasticity and variance/outliers issue by assigning appropriate weights to observations, ensuring that each observation contributes proportionally to the overall estimation process. Various results from pooled OLS, FE (two-way),

15

weighted panel two way fixed effect and logged transformation are run and obtained as a plausible address to our research question.

#### A Brief on Two way Fixed Effect Model

The two-way linear fixed effects regression (2FE) has become the standard approach for estimating causal effects in panel data analysis. Many researchers utilize the 2FE estimator to simultaneously account for unobserved confounders specific to units and time periods (Imai et al., 2020). However, we need to understand that the 2FE model's capability to simultaneously account for these two types of unobserved confounders is heavily dependent on the assumption of linear additive effects. That is, its validity fundamentally rests on the modeling assumptions. With this fact, let us discuss briefly about the basic model assumptions, paramenters of interest and implication of the TWFE from mathematical notations and derievation.

#### Regression, assumptions and some special cases

Hereby, we will shortly present TWFE model estimations, along with its basic assumptions, parameters, issues with the weights, heterogenous treatment effect, and its implications in terms of first difference, commons trends, treatment monotonity, Local Average treatment effect of the switchers and some other special cases as well. Lets consider the following two-way linear fixed effects (2FE) regression model,

$$Y_{it} = \alpha_i + \gamma_t + \beta X_{it} + \varepsilon_{it}$$

For i = 1, 2, ..., N and t = 1, 2, ..., T where  $\alpha_i$  and  $\gamma_t$  are unit and time fixed effects, respectively.

Assume that one is interested in measuring the effect of a treatment D on some outcome Y. We first assume for simplicity that D is binary, but most of our results apply to any ordered treatment. Here, Binary variable is equivalent to the treatment covariates (Xit) in our research as well. We also assume that the population can be segmented into a finite number of time periods, denoted by the random variable  $T \in \{0, 1, ..., t\}$ , and into a finite number of groups, denoted by the random variable  $G \in \{0, 1, ..., g\}$ . Each group-period combination may contain multiple units or just one unit. In the case of a single unit, all the random variables we consider, given G and T, become degenerate. For any random variable R and for every  $(g, t) \in \{0, ..., g\} \times \{0, ..., t\}$ , let  $R_{g,..} R_{.,t}$ , and  $R_{g,t}$  respectively be random variables such that  $R_{g,..} \sim R | G=g, R_{.,t} \sim R | T = t$ , and  $R_{g,t} \sim R | G=g, T = t$ , where  $\sim$  denotes equality in distribution. Finally, let F  $D_R(g, t) = E(R_{g,t}) - E(R_{g,t-1})$  denote the conditional first-difference operator. This notational shortcut is useful to avoid the notational burden of, e.g., evaluating the function (g, t)

→ E(Dg,t) at (G, T – 1). For Fixed effect regression, let  $\beta_{fe}$  denote the coefficient of E(D|G,T) in an OLS regression of Y on a constant,  $(1{G = g})_{1 \le g \le g}, (1{T = t})_{1 \le t \le t}, and E(D|G,T)$ . From viewing it from first difference regression,  $\beta_{fd}$  denote the coefficient of FDD(G,T) in an OLS regression of FDY (G,T) on a constant,  $(1{T = t})_{2\le t\le t}, and FDD(G,T)$ , conditional on  $T \ge 1$ . For all  $t \in \{1, ..., t\}, E(Y(0)|G, T = t)-E(Y(0)|G, T = t-1)$  does not depend on G. (Common trend assumption). In case of treatment Monotonicity, D = D(T); For all  $t \in \{1, ..., t\}, D(t) \perp T|G$ ; For all  $t \in \{1, ..., t\}, P(D(t) \ge D(t-1)|G)=1$  or  $P(D(t) \le D(t-1)|G)=1$ . For all  $(g, t) \in \{0, ..., g\} \times \{1, ..., t\}, E(Y(1)-Y(0)|G=g, T = t, D(t-1) = 1) = E(Y(1)-Y(0)|G = g, T = t-1, D(t-1) = 1)$ (Stable treatment effect).

We also have special case with two group and period. Where,  $\beta_{fe} = \beta_{fd} = [E(Y1,1) - E(Y1,0) - E(Y0,1) + E(Y0,0)]/ [E(D1,1) - E(D1,0) - E(D0,1) + E(D0,0)]$ . Also, lets first assume that  $D = G \times T$ : only units in group 1 and period 1 receive the treatment, a case often referred to as a "sharp" DID. Then,  $\beta_{fe} = \beta_{fd} = E(Y_{1,1}) - E(Y_{1,0}) - E(Y_{0,1}) + E(Y_{0,0})$ , and one can show that  $\beta_{fe} = \beta_{fd}$  equals to delta at treatment (1,1). Following is two way FE estimator as a weighted sum of Avearage treatment effect.

$$\beta_{k} = \sum_{g=0}^{\bar{g}} \sum_{t=0}^{\bar{t}} P(G = g, T = t | D = 1) w_{k,g,t} \Delta_{g,t}^{TR}$$
$$\beta_{k} = \sum_{g=0}^{\bar{g}} \sum_{t=1}^{\bar{t}} P(G = g, T = t | S) \omega_{k,g,t} \Delta_{g,t}^{S}.$$

FE model incorporating weighted linear two way FE estimation is as follows:

$$\begin{split} \hat{\beta}_{\text{DiD}} &= \frac{\sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(X_{it} - \overline{X}_{i}^{*} - \overline{X}_{t}^{*} + \overline{X}^{*})(Y_{it} - \overline{Y}_{i}^{*} - \overline{Y}_{t}^{*} + \overline{Y}^{*})}{\sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(X_{it} - \overline{X}_{i}^{*} - \overline{X}_{t}^{*} + \overline{X}^{*})^{2}} \\ &= \frac{\frac{1}{2} \sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(2X_{it} - 1)(Y_{it} - \overline{Y}_{i}^{*} - \overline{Y}_{t}^{*} + \overline{Y}^{*})}{\frac{1}{4} \sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(2X_{it} - 1)(Y_{it} - \overline{Y}_{i}^{*} - \overline{Y}_{t}^{*} + \overline{Y}^{*})} \\ &= \frac{1}{\sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}} \sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(2X_{it} - 1)(Y_{it} - \overline{Y}_{i}^{*} - \overline{Y}_{t}^{*} + \overline{Y}^{*}) \\ &= \frac{1}{\sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}} \sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(2X_{it} - 1)(Y_{it} - \overline{Y}_{i}^{*} - \overline{Y}_{t}^{*} + \overline{Y}^{*}) \\ &= \frac{1}{\sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}} \sum_{i=1}^{N} \sum_{t=1}^{T} W_{it}(2X_{it} - 1)Y_{it} \\ &= \frac{1}{\sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}} \sum_{i=1}^{N} \sum_{t=1}^{T} \left\{ \left( \sum_{i=1}^{N} \sum_{t=1}^{T} w_{it}^{i't'}(2X_{it} - 1)Y_{it} \right) + (1 - X_{i't'}) \left( \sum_{i=1}^{N} \sum_{t=1}^{T} w_{it}^{i't'}(2X_{it} - 1)Y_{it} \right) \right\} \\ &= \frac{1}{\sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}} \sum_{i'=1}^{N} \sum_{t'=1}^{T} D_{i't'} \left\{ X_{i't'} \left( Y_{i't'} - Y_{i',t'-1} - \frac{\sum_{(i,t') \in \mathcal{N}_{i't'}^{DD}}Y_{it'}}{\#\mathcal{N}_{i't'}^{DD}} + \frac{\sum_{(i,t) \in \mathcal{A}_{i't'}^{DD}}Y_{it}}{\#\mathcal{A}_{i't'}^{DD}} \right) \\ &+ (1 - X_{i't'}) \left( Y_{i',t'-1} + \frac{\sum_{(i,t') \in \mathcal{N}_{i't'}^{DD}}Y_{it'}}{\#\mathcal{N}_{i't'}^{DD}} - \frac{\sum_{(i,t) \in \mathcal{A}_{i't'}^{DD}}Y_{it}}{\#\mathcal{A}_{i't'}^{DD}} - Y_{i't'} \right) \right\} \\ &= \frac{1}{\sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}} \sum_{i=1}^{N} \sum_{t=1}^{T} D_{it}(\widehat{Y_{i}(1)} - \widehat{Y_{i}(0)}) = \hat{\tau}_{\text{DD}} \end{split}$$

Further, we have various modes of estimating the parameter of FE such as estimation using dummy, using demeaning, using matrix form and so on. Thus, the discussion above is supposed to understand

the theoritical model assumption perspective and recent development in panel FE model. In the coming section, we describe briefly about our research Model specification.

## **Model specification**

Following models are designed for the analysis of Merger on stability in our work. This model is supposed to answer our research question in a simplified manner.

For Stability in terms of Z-score:

 $Z_{it} = \alpha_i + \beta Merged_{it} + \varepsilon_{it} \qquad (Eq.1) \text{ General equation}$   $Z_{it} = \beta Merged_{it} + FE_i + \varepsilon_{it} \qquad (Eq.2) \text{ Eq. with individual fixed effect}$   $Z_{it} = \beta Merged_{it} + FE_t + \varepsilon_{it} \qquad (Eq.3) \text{ Eq. with time fixed effect}$  Model specifically used in our research  $Z_{it} = \beta Merged_{it} + FE_i + FE_t + \varepsilon_{it} \qquad (Eq.3) \text{ Eq. with two way fixed effect (2FE)}$ 

Where,  $\alpha_i$  is a constant term (intercept),  $Z_{it}$  is stability index for bank i at time t, Merged<sub>it</sub> is index for bank i at time t (1 for Merged), FE<sub>i</sub> is the Fixed Effect specific to a bank, FE<sub>t</sub> is the Time fixed effect,  $\varepsilon_{it}$ the error term for each data points. Our research is specifically circumvented around **fixed effect (2FE) model (eq 3)** where time and bank specific factors are jointly controlled for

## 4. EMPIRICAL RESULTS AND ANALYSIS

#### 4.1 Data Visualization

We are interested to see how the heterogeinty among the banks varies among each other. Heterogeneity among banks refers to the differences and variations that exist between individual banks. These differences can be in terms of their characteristics (risk appetite), behaviors, performance, risk profiles (CAMELS rating), strategies, resources, and other attributes. Heterogeneity acknowledges that not all banks are the same, and these differences can significantly influence their operations and responses to external factors. If there is significant heterogeinty among banks it is wise to control for the bank features.



Chart 3: Heterogeinty among banks

The graph clearly depicts that there are significant variances among banks existing in the system. Bank ID (8, 11, 18) are most stable and Bank ID (5, 12, 30) are less stable in terms of stability index we have used in the research. For other banks too, there is no uniformity in the z-score suggesting us that bank specific feature influencing the stability is wise to be controlled in the study for reducing bias and improving estimation accuracy.

Apart from earlier explained individual heterogeneity, several time trends are supposedly affecting the stability of banks. Economic cycles (interest rate trends and business cycles), technological advancement, Regulatory changes, Market and credit risks, Demographic changes, Globalization, and geopolitical risks, ESG trends and consumer behavior all affect bank's stability. To elaborate: Fluctuations in economic activity, such as periods of expansion and recession, impact bank stability. During expansions, loan demand and profitability typically increase, whereas during recessions, loan defaults may rise, stressing bank balance sheets. Likewise, Prolonged low-interest rates can compress net interest margins (the difference between interest earned on loans and paid on deposits), affecting profitability. Conversely, rapidly rising rates can lead to increased defaults and reduced loan demand. Others aspects like interest rate trend (Prolonged low-interest rates can compress net interest margins affecting profitability), digital banking, blockchains and cryptocurrencies may enhance efficiency but pose regulatory challenges, regulatory changes like strict capital requirement and AML-CFT cushion requirements, Market volatility and credit trend (market risks), globalizationa nd geopolitical risks (cross border banking and geopolitical tensions), Environmental and social governance trends (zero carbon finance and ESG investments), consumer behavior (saving, borrowing trends), demographic changes (aeiging and market/ banking product preferences trends) which are key time determinant macro trends affecting the bank's stability.





Further, the graph above shows the comparison between the movement in time fixed effect (left) and overall banking system z-score (right). The two figures show roughly parallel movement between the time trends (TFE) and overall banking system z-score. The plots above imply that within the comparable time frame, effect of time on stability (TFE) plot matches (roughly parallel) with the overall

banking system stability index. For simplicity assuming homogeneous banks, each bank stability index moves in a similar direction/trend with time trends (TFE) plot.

This gives us an indication that the stability of banks is affected significantly by time related macroeconomic factors (trends) as explained earlier such as economic cycle, regulatory changes which we collectively call as unobserved heterogeneity over time in our study. Therefore, we expect that controlling for time related macro trends along with bank specific factors would be better to address our research question that plausibly can explain the impact of Bank Merger in stability as denoted in the Model specification discussed earlier.

#### 4.2 Empirical Result

Following the research question, gaps, and model specification, we present our empirical result obtained from R-software to assess the impact of bank merger in stability of the banks explained by z-score. The table below presents the coefficients, standard errors, and their significance levels, highlighting the relationships between the variables and their statistical robustness.

Table 4: Regression result

		Dependent variable:		
	Z.S	Z.Score		
	(TWFE)	(Wtd TWFE)	(Logged)	
Merged	$\begin{array}{c} 4.100^{***} \\ (0.748) \end{array}$	$3.887^{***}$ (0.742)	0.302*** (0.034)	
Observations	900	900	899	
$\mathbb{R}^2$	0.035	0.035	0.088	
F Statistic	$30.041^{***}$ (df = 1; 840)	$27.466^{***}$ (df = 1; 840)	$81.029^{***}$ (df = 1; 839)	
Note:		*p<	(0.1; **p<0.05; ***p<0.01	

The result shows the impact of Merger of banks in their stability. **First column** shows the impact of Merger in stability from two-way FE model (TWFE). It is obtained that with the Merger, bank's stability increases by 4.1 units and the result is statistically significant at 1 percent signifying that Merged bank is more stable than unmerged banks. The coefficient of determination is 3.5 percent which is not very high but with large number of factors that might affect bank stability, roughly 3.5 percent impact from merger cannot be ignored. F-statistics of the first model is 30.04 pointing a high degree of model significance.

**Second column** shows the impact of Merger in stability from weighted two-way FE model (Wtd. TWFE). In the weighted model, each observation is weighted by a factor of w<sub>it</sub> and the estimation process takes these weights into consideration. In our case, we assign weights based on inverse square

root of variance of each observation. Weighted models are better suited in a circumstance where there is presence of significant outliers, significant variance of the error terms across observation and/or heteroskedasticity in data. It helps to stabilize the variance, leading to more reliable estimates. From Wtd. TWFE model, it is obtained that with the Merger, bank's stability increases by 3.88 units and the result is statistically significant at 1 percent signifying that Merged bank is more stable than unmerged banks. The coefficient of determination is 3.5 percent also in this case which is not very high but with large number of factors that might affect bank stability, roughly 3.5 percent impact from merger cannot be ignored. F-statistics of the first model is 27.44 pointing a high degree of model significance.

**Third column** is the logged TWFE model with log transformation of the stability index regressed on merger. From logged TWFE model, it is obtained that with the Merger, bank's stability increases by 0.302 percent and the result is statistically significant at 1 percent signifying that Merged bank is more stable than unmerged banks. The logged model however posits that the impact is highly significant but materially small. The coefficient of determination is 8.8 percent higher than that of the earlier two forms of model. In terms of explanatory power, coefficient of determination (R<sup>2</sup>) of around 9 percent shows that merger is one of the key variables affecting the stability of banks. F-statistics of the first model is 81.02 pointing a further higher degree of model significance.

Thus, we can conclude that Merged banks are more stable than their unmerged counterparts which is good news for the policy makers who introduced this policy too. As banks become more stable from the consolidation arising from Merger, we can also infer that Merger policy promulgated for stability of the financial system is probably doing a good job. The fact we need to be careful is that sum of individual bank stability may not give the idea of aggregate financial system stability due to several factors discussed earlier in the paper. But, in general Merger policy introduced in Nepal has helped enhance stability of Merged banks which ultimately contributes to financial stability.

#### 4.4 Diagonostic Test and Robustness

All the three forms of fixed effect model (un-weighted, weighted and logged) gave same sort of indication of merger and stability relation. Now, we are doing some set of procedures used to test the reliability and stability of the results obtained from our used model. The purpose of robustness checks is to ensure that the conclusions drawn from the analysis are not overly dependent on specific assumptions, sample characteristics, model specifications, or estimation methods that helps to enhance the credibility and reliability of the research findings. Diagnostic tests such as the Shapiro-Wilk test and the Breusch-Pagan test are used in our regression to assess the validity of key

22

assumptions underlying statistical models. Ensuring these assumptions hold is crucial for the reliability and validity of the model's results.

Breusch-Pagan test involves regressing the squared residuals from the original regression on the independent variables. A significant result (low p-value) suggests that the variance of the residuals is not constant (heteroskedasticity is present) and vice-versa. Likewise, Shapiro-Wilk test compares the order statistics of the residuals to the expected order statistics of a low p-value (typically < 0.05) indicates that the residuals significantly deviate from a normal distribution, suggesting the need for corrective measures like transforming the data or using a different modeling approach.

S.N	Model	Normality (Shapiro-Wilk)	Heteroskedasticity (Bruesh-Pagan)	Robustness
1.	TWFE	W= 0.94, p-value < 0.05 (non Normality)	BP= 9.26 , df=1, p-value < 0.05	Moderate reliability in terms of Normality and heteroskedasticity
2.	Wtd. TWFE	W= 0.9515, p-value < 0.05 (non Normality)	BP= 25.7, df= 1, p-value < 0.05	Moderate reliability in terms of Normality and heteroskedasticity
3.	Logged	W= 0.6865, p-value < 0.05 (good)	BP= 2.42 , df= 1, p-value > 0.11 (good)	Better reliability in terms of Normality and Heteroskedasticity

Table 5: Some Useful Robustness Checks.

Source: Author's calculation

Significant result at 1 percent in all the three model is good for us in terms of the statistical evidence and its ability to conclude from the model analysis. However, we are also interested to see the reliability and validity of the model in terms of underlying assumptions. TWFE and weighted model has some issue of normality and heteroskedasticity. This would have been minimized if we could have data from long time span with more merger taking place within the period. Two-way fixed effect with log transformation is better reliable in terms of normality and heteroskedasticity as their Shapiro test w-value is lower than the earlier two model and BP test value is 0.11 (greater than 0.05) signifying no heteroskedasticity.

## 4.5 Empirical Result Compared

In the table below, we will briefly discuss findings from other similar studies and later relate them with our findings with possible explanation of our result tallying it with field experience from Nepal. Most of the study related to stability analysis of banks take z-score as a dependent or outcome variable. Regressor varies in the studies ranging from Lerner index, NPL, Boone Indicator, Efficiency Index etc. In terms of methodology, most of the study have used panel regression while some adopted GMM, PCA, dynamic panel etc.

Study	Region/country	Features/ Methodology	Findings
Berger et al., (2009)	23 developed Nations (IMF high income countries)	GMM estimation, Lerner, HHI and bank capitalization etc.	Charter Value hypothesis
Kabir et al., (2017)	16 Islamic developing countries (name not mentioned)	Panel vector autoregressive (PVAR) estimation, Z-score, Lerner Index, NPL etc	Competition reduces stability
Khanal (2024)	6 commercial banks in Nepal (2014-2019)	NPL, CR5, HHI etc. used as various proxies	Competition reduces stability
GC (2016)	26 commercial banks in Nepal (1999-2012)	Annual data, FE model, HHI, n-bank concentration etc.	Competition improves stability
Micco (2007)	8 commercial banks in Latin America		Competition-stability nexus
		Research- Single Country Context	
Study	Methodology	Country Features	Findings
Study in Bangladesh Saha (2021)	30 commercial banks in Bangladesh (2009- 2017) Z-score, Boone Indicator, Efficiency Index. Panel data, GMM, and PCA.	Country status-Developing country (S. Asia) GDP- \$ 460 billion (in 2022) GDP per capita- \$ 2688 (Nep \$ 1337) GDP Growth rate- 7.1 % (Nep 6.34 %) No. of banks- 61 (9 branches per 100000 population as on 2021) (Nepal 22)	Competition reduces stability (after a certain threshold)
Yusgiantoro et al., (2019)	122 commercial banks (2010-2015), dynamic panel data analysis, ZEQTA, ZCAR, Lerner etc.	Developing/ Emerging Upper Middle-Income country in Asia GDP- \$ 1319 billion GDP per capita- \$ 4788 GDP Growth rate- 5.31 % No. of banks- 106 commercial banks (16 per 100000 as on 2021)	Higher market power reduces bank insolvency risk, but sometimes can be detrimental for financial stability, (depending on bank-specific characteristics)
Bank Negara statement (Feb 5, 2020)	Central Bank of Malaysia	Based on their in-house research	Large banks (consolidation) contribute to stability better

Table 6: Drawing Analogy from Prior Studies

Source: Compiled by authors from the literature referred

Earlier studies mainly have aligned their study to assess the impact of bank consolidation in terms of size, or bank concentration and so on. However, our study used merger variable explicitly to study consolidation conundrum and impact of bank merger in the stability.

In the cross country analysis done by Berger (2008) and Kabir (2017), charter value hypothesis of consolidation-stability relation is pronounced. Our study also obtained the similar result supporting the charter value hypothesis. With merger, we assume that bank consolidation by merger decreases competition (at least in terms of HHI index) and this impacts stability positively streamlining to charter value hypothesis.

Single country study by Saha (2021) done in Bangladesh, a country that we can say to be like Nepal in terms of number of banks and other economic indicators also got similar result to our study. Study done by Bank of Malaysia got similar result where large bank contributes to stability better. Thus, our study also aligned with several other studies (cross country and single country) supporting one of the few possible pathways of consolidation and stability in literature. But some other studies have come up with contradicting findings too as mentioned in the table above.

## 4.6 Analogy of Result with Field Experience

This section briefly tries to draw some possible analogy between our empirical result and story from the filed story of Nepal Banking system. Our empirical result is more reliable in case of nepal due to the fact that C-S hypothesis would better prevail in an environment of perfectly free market with little information asymetry among the players (as seen in earlier literature findings), but in Nepal, market distortions, asymetry and structural hassles exist (as a developing or a least developed country). C-S hypothesis is noted to be established in country adopting free market with good market infrastructure and information transparency/disclosure between the market players. Our result shows that in Nepal, less competition (due to merger) is expected to increase the stability of the banks.

More competition is supposed to create undue pressures among banks to meet their lending targets, fight among the limited customer base/pool (Total population 28 million) available in the country (more intense in city areas). There are higher risk of moral harards and inf asymetry which affects the profitability and stability of the banks as well. After the Merger policy we have noticed less bank banktrupcy cases which were a bit more frequent during period 2000-2010 prior to the introduction of the Merger Policy which aligns to our empirical results too. Further, we can assume that capital base improved after Merger and banks benifitted from learning spillover from their merged counterparts.

## 5. DISCUSSION AND CONCLUSION

In this section, we try to draw some conclusion and limitations of our study. We have noted from our result that Merger led to stable banks. In other word, stability after bank Merger policy was attained to some extent. But there are few other issues which we need to consider concomitantly.

## 5.1 Conclusion

To sum up, study of merger of BFIs in Nepal throughout the research work shows that merger has been successful to enhance stability which has been already explained in the Empirical Results and Analysis section of this paper. From our result, the regulator can be **at least optimistic** about their decision to initiate Merger Policy in Nepal a decade back. The positive impact from Merger are statistically significant in all 3 forms of assesement but logged model gave materially or practically lower magnitute of impact (0.304 percent). Even it is lower in magnitute, it is a clear evidence. Merger should also be viewed as a natural dealings in Nepal banking industry encouraged by regulator for various objective including stability goals and should be better viewed as a **manageable challenge** to attain more pronounced stability and resilience goals. From statistically significant but materially less magnitute of impact, we can **think of policy changes** to address issues like optimization or best partner selection module, issue of bank size, asset quality and inclusion aspects that helps built materially better stability. However, other linkages are worth studying before launching any further changes.

It is equally important to consider that impact of merger of BFIs over stability aspect should not be viewed only from the empirical perspective but also be taken as a **strategic process** of banking businesses whose reflection in stability can be more conspicious in distant future too. If the structural challenges of Nepalese economy are resolved, shadow economy streamlined and financial inclusion pervades aided by efficient payment system, we can be naturally expect the banks to be more viable and stable with many economic linkages catalyzed from banking system.

#### 5.2 Limitation of the Study and Future Direction

The most pronounced limitation of our study is the **use of z-score** to measure stability. It is more simple and has computational ease that views stability in terms of accounting figures, distance of bank profit position from the bank bankruptcy threat, capital position etc. However, there are so many issues to influence the stability which we have not considered in the study such as banks' interconnectedness, contagion effect, information asymmetry affecting stability of banks, moral hazards from market players, bank risk factor, HR capacity spillover affecting stability, culture compatibility of merged bank affecting their performance, capitalization impact, most optimal

merging partner for best stability etc (Rancoroni, 2021). Many instrumental aspect of stability are out of our scope.

Further, Some notable merger incident took place recently which could not be incorporated in our study due to unavailability of the final data. Incident of more bank Merger cases that took recently (1,2 years ago) can be included in future research with **more span of data**. In doing so, we can take longer time span in the study of Merger and Inclusion of more data points may help obtain more better or clear result with more robustness too.

Future studies can include **several variables** like HHI index, market power calculation, capitalization issue (Basel III) as a moderating factor in C-S paradigm and z-score jointly or separately and also other measures for calculation of **financial stability** as a whole that could establish better articulation and more linkages.

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