FINANCIAL INCLUSION AND SUSTAINABLE DEVELOPMENT: A CROSS-COUNTRY ANALYSIS

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DEDICATION

To all my lovely family members and respected supervisors who have given

me unwavering support in the pursuit of excellence in my study.

ABSTRACT

FINANCIAL INCLUSION AND SUSTAINABLE DEVELOPMENT: A CROSS-COUNTRY ANALYSIS

Yap Shen

As part of the financial inclusion continuum, insurance is identified as an instrument advancing financial inclusion by allowing individuals to access instruments that safeguard their lives, health, and assets. In the limited studies that incorporated insurance in their financial inclusion measure, the effects of life and non-life insurance are undistinguished. In addition, there is growing awareness in relation to the interconnection between financial inclusion and sustainable development.

This research aims to bridge the research gap by computing a financial inclusion index consisting of life and non-life insurance altogether with traditional banking indicators. Hence, this study investigates the impact of financial inclusion on 7 finance-related aspects of Sustainable Development Goals (SDG) as outlined by the World Bank. They are eradicating poverty (SDG1); ending hunger and promoting sustainable agriculture (SDG2); promoting health and well-being (SDG3); achieving gender equality and

economic empowerment of women (SDG5); promoting economic growth and jobs (SDG8); supporting industry, innovation, and infrastructure (SDG9); and reducing inequality (SDG10).

Firstly, this study computes a multidimensional financial inclusion index (FI index) incorporating banking, life, and non-life insurance indicators for 78 countries from 2015 to 2019 using an Euclidean distance method. Secondly, the study examines the relationship between financial inclusion and sustainable development in the sample countries from 2017 to 2019 through panel regression models. The difference in the sample period for computation of the financial inclusion index (2015 – 2019) and cross-estimations (2017 – 2019) is due to the SDG data being available only from 2017, whereas the longer period for the FI index is meant to illustrate its five years trend for research objective 1.

The FI index reveals higher financial inclusion in high-income countries in the European region as compared to that of medium-income countries in the Asian and African regions. When life insurance indicators are taken into account, some countries leapfrog in their financial inclusion levels, whereas most countries witness a drop in their financial inclusion level. Meanwhile, non-life insurance appears to have a more prominent impact on overall financial inclusivity in the sample countries. The findings from the first objective indicate a lack of contribution of the insurance to financial inclusion, especially life insurance.

The results from the second objective show that financial inclusion is positively related to SDGs 2, 5, and 8 but not SDGs 1, 3, 9, and 10 for the selected countries. The results also exhibit a significant positive relationship between financial inclusion and overall sustainable development. Besides, the favourable effects of financial inclusion on sustainable development are magnified when life and non-life insurance are considered, implying that insurance is a financial service segment that complements financial inclusivity in the promotion of sustainable development. The findings from this study suggest that governments emphasize the delivery of insurance to close the financial gap given the changing financial landscape.

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SUBMISSION OF DISSERTATION

It is hereby certified that **Yap Shen** (ID No: **21UKM06020**) has completed this dissertation entitled *"FINANCIAL INCLUSION AND SUSTAINABLE DEVELOPMENT: A CROSS-COUNTRY ANALYSIS"* under the supervision of Dr. Lee Hui Shan (Supervisor) from the Department of Economics, Faculty of Accountancy and Management, and Dr. Liew Ping Xin (Co-supervisor) from the Department of Economics, Faculty of Accountancy and Management.

I understand that the University will upload a softcopy of my dissertation in pdf format into UTAR Institutional Repository, which may be made accessible to the UTAR community and the public.

Yours faithfully,

_____YAP_____

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APPROVAL SHEET

This thesis/dissertation entitled "**FINANCIAL INCLUSION AND SUSTAINABLE DEVELOPMENT: A CROSS-COUNTRY ANALYSIS**" was prepared by YAP SHEN and submitted as partial fulfilment of the requirements for the degree of Master of Philosophy at Universiti Tunku Abdul Rahman.

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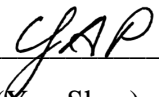
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DECLARATION

I, Yap Shen hereby declare that the dissertation is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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Date: 19.7.2023

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LIST OF ABBREVIATIONS

Abbreviations	Full Name
ADA	Appui au Développement Autonome
ASEAN	Association of Southeast Asian Nations
ATM	Automated Teller Machines
COVID-19	Coronavirus Disease 2019
FA	Factor Analysis
FE	Fixed Effect
FEM	Fixed Effect Model
FI	Financial Inclusion
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
HDI	Human Development Index
IMF	International Monetary Fund
KMO	Kaiser–Meyer–Olkin
MENA	Middle East and North Africa
OECD	Organisation for Economic Co-operation and Development
OIC	Organisation of Islamic Cooperation

OLS	Ordinary Least Square
PCA	Principal Component Analysis
POLS	Pooled Ordinary Least Square
RE	Random Effect
REM	Random Effect Model
R&D	Research and Development
SDG	Sustainable Development Goal
SME	Small and Medium Enterprise
UNDP	United Nations Development Program

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter includes the background of the study, problem statement, research questions, research objectives, and significance of the study. First, it describes the challenges to achieving financial inclusion and how life and non-life insurance offerings can address them, along with their definition. Given the importance of quantifying the extent of financial inclusion before improving it, this chapter further elaborates on the existing measurement of the financial inclusion level of a given country. Finally, it delves into the potential interrelation between insurance in financial inclusion and sustainable development.

1.1 Research Background

1.1.1 The Issue of Financial Inclusion

As a prerequisite of robust economic growth, a vital underpinning of a vibrant financial system is enabling an efficient allocation of productive resources by mitigating asymmetric information, transaction cost, and other market deficiencies. However, in a world where the market is far from ideal, the optimal allocation of capital resources is persistently compromised, causing a

whopping 1.4 billion individuals to remain deprived of formal financial services, according to the World Bank (2021) in the Global Findex Database 2021.

At the international level, Bangladesh, China, India, Indonesia, Mexico, Nigeria, and Pakistan are the top 7 countries where the unbanked population is the largest, contributing to nearly half of the unbanked population globally due to underdevelopment and discrimination in their financial market (Carbó et al., 2005). Regional-wise, the list of financial exclusion goes as follows: 50% of the Middle East and African population is financially excluded, South and Central America follow at 38%, Eastern Europe at 33%, and Asia Pacific's share stands at 24% (Ventura, 2021). While the problem is most prevalent in developing regions, it is unavoidable even in the some of most-developed regions of the world. In Western and Central Europe, only 6% of the population is financially excluded, but in North America, the proportion reaches 21%.

The pressing issue of financial exclusion in developed economies implies that a well-developed financial system does not guarantee its all-inclusivity. Hence, while actively developing their financial systems, governments need to pay close attention to expanding access to finance to everyone in their promotion of equal financial opportunities as the foundation for shared prosperity.

Financial inclusion drives economic development by creating room for capital accumulation, increasing investment in high-value-added activities, and catalysing technological advancement. Bellens (2018) estimated that expansion

of financial inclusion could boost GDP by as much as 14% in emerging countries such as India and up to 30% in frontier economies such as Kenya by increasing individuals' entrepreneurial opportunities and income levels through investment in education, health, and new technologies. Unquestionably, this outcome can be achieved if only the underprivileged entered a formal financial system, where they can use various financial services to transfer and receive money effectively, handle medical emergencies, build upon their savings, and create new business start-ups (Kandpal, 2020).

1.1.2 Definition of Financial Inclusion

Financial inclusion is the silver lining that helps bridge the gaps by providing individuals and households with access to affordable financial services to support their consumption and investment. Financial inclusion is formally viewed as a state where everyone can access appropriate and desired financial products and services to manage their financial lives. According to Rangarajan (2008), financial inclusion is defined as the process of ensuring access to financial services and timely and adequate credit where needed by vulnerable groups such as the weaker sections and low-income groups at an affordable cost. Hence, financial inclusion applies only when people are allowed to use formal bank accounts and relevant financial services such as insurance, savings, and pensions.

1.1.3 Insurance in Financial Inclusion

The insurance industry is steadily growing and has emerged as one of the largest financial service industries globally. The COVID-19 pandemic has demonstrated why the insurance industry is essential to both global economic health and financial wellness. Despite an upward trend in the global insurance industry, its distribution is unequal. As shown in global insurance pool statistics and trends, the development of the insurance industry (as measured by total insurance premiums) is mainly dominated by the Americas, followed by Europe, the Middle East, and Africa, and then only Asia-Pacific. The good news, the insurance industry in Asia-Pacific is fast-expanding and nearly overtakes Europe, the Middle East, and Africa in the year 2019. On the other side of the coin, gaps continue to exist in insurance uptake in different regions, especially after the outbreak of the COVID-19 pandemic where millions lost their sources of income, if not their lives.

As part of the financial inclusion continuum, insurance plays a major role in supporting people's lives and upholding the economy. Insurance protects against unexpected financial shocks that undermine individuals' progress. Such shocks impact people's livelihoods by depleting savings and pushing people into debt and eroding poverty gains. Insurance serves as a protector of people's lives, health, and assets by covering unforeseen costs (Cámara & Tuesta, 2015). Besides, insurance builds financial resilience as it provides a financial safety net and protection for vulnerable groups. At times the lowest-income individuals and households struggle to escape from the poverty trap and move up the social

ladder; they inevitably encounter unpredicted shocks that cause them to experience a drop in income or, worse, abandon them back to where they previously started. Without insurance, these vulnerable individuals or households can hardly progress due to exposure to various potential risks that affect their lives or wealth.

Insurance has 2 main categories, namely life insurance and non-life insurance. Non-life insurance compensates losses that are incurred from a specific event to the insured. It includes any insurance that is not related to life insurance. Homeowners' policies, motor insurance policies, marine insurance, damage coverage from fire, calamities, theft, travel insurance, or any online breach incident related to cybersecurity are classified as non-life insurance policies. Non-life insurance provides coverage mainly to people, legal liabilities, and properties.

Meanwhile, life insurance is a legal contract between the insurer and the policy owner. A life insurance policy guarantees the beneficiaries receive a payout when the insured dies within the coverage. In the event of the death of the family's provider, insurance will ensure immediate financial security for the family that would have suffered more severely without one.

As a result of providing coverage and protection to individuals and households against losses due to unforeseen risks, the insurance market can stimulate economic growth and foster industrial progress by creating a good investment climate where risks are managed efficiently. Moreover, insurance

encourages savings among individuals and generates productive employment for the poor. More specifically, insurance promotes financial stability, mobilises savings, facilitates trade and commerce, enables effective risk management, encourages loss mitigation, and fosters efficient capital allocation. The emergence of new technologies that revolutionise the insurance industry has further unveiled the potential of insurance in accelerating financial inclusiveness. As a result, insurance is a segment that the World Bank highly emphasises in its efforts to promote financial inclusion.

1.1.4 Measurement of Financial Inclusion

Measuring financial inclusion is important before evaluating the effects of various initiatives stakeholders take and for policymakers to formulate their action plans. Despite its importance being widely acknowledged, a formal consensus in the literature on financial inclusion measurement is yet achieved. Demirgüç-Kunt and Klapper (2012) constructed a database of Global Findex by surveying 150,000 adults from 148 countries in 2011. A merit of using survey data to compute a composite FI index is its extensive coverage, making cross-country comparison possible. However, conducting such a worldwide survey regularly is challenging due to time and budget constraints. Thus, measuring financial inclusion using survey data is impractical as most data are not readily available at all intervals and periods.

To address the pitfall of a lack of data, International Monetary Fund (IMF) introduced a new financial development index which covers 183

countries over the period 1980–2014. The database provides a strong analytical tool to measure financial inclusion (Svirydzenka, 2016). However, its emphasis is on financial market development in terms of financial depth and market efficiency instead of financial inclusion. Other studies use broad financial development indicators to partially capture financial inclusion's function.

The indicators of an FI Index, either from a macro or micro approach, are crucial to providing nuanced insights into certain aspects of an inclusive financial system (Sarma, 2012). Nevertheless, it is noteworthy that when the indicators are used separately, they may not portray a complete overview of an inclusive financial system. Choosing the indicators arbitrarily may also cause the financial inclusion level to be inaccurately measured. A common practice of the contemporary literature is to quantify an FI index by considering indicators from different dimensions to provide a comprehensive financial inclusion measure.

1.1.5 Financial Inclusion and Sustainable Development

Besides financial inclusion measurement, recent investigations have given rise to a vivid interest in examining the impacts of financial inclusion on various aspects of sustainable development on both single-country and cross-country levels. For instance, Chima et al. (2021) reported that financial inclusion is conducive to economic growth in Sub-Saharan Africa (SSA) by providing effective distribution of funds for investment and risk management. Other authors have made similar assertions at the cross-country level, namely

Ziola et al. (2020) for OECD members and Dahiya and Kumar (2020) for developing countries. Triki and Faye (2013) stated that a well-inclusive financial system significantly affects economic growth.

However, Menyelim et al. (2021) found a mixed and inconclusive result: financial inclusion fosters economic growth through inequality reduction. The reason underlying their findings is that various financial products in the market might not be purposefully designed for the poor and the marginalised. The implication is consistent with Demir et al. (2022), who posited that although the introduction of Fintech reduces overall income inequality by making the financial system more inclusive, its effect is more evident in high-income groups.

Other studies emphasised the welfare effect of financial inclusion on sustainable development (Ofori-Abebrese et al., 2020; Matekenya et al., 2020). They revealed that higher financial inclusion contributes significantly to human development by inducing higher income, an inclusive healthcare system, and greater educational opportunities. A well-developed financial system is also conducive to poverty reduction and ending hunger in the agricultural sector, leading to higher agricultural productivity and commercialisation (Claessens & Feijen, 2007). Notwithstanding, a single-country level study by Inoue (2018) found that the effect of financial deepening and inclusiveness on poverty is subject to whether the financial services are delivered by private or public sector banks, reemphasising the importance of synergy between both sectors. From a gender perspective, financial inclusiveness and micro-financing reduce gender

inequality, but its magnitude hinges on religion, conservatism, and other cultural characteristics (Zhang & Posso, 2017).

As one of the core pillars of the World Bank's sustainable development agenda to ensure universal financial access (Khmous & Besim, 2020), financial inclusion and the attendant expansion of its facilities are positioned prominently as a veritable tool to achieve 7 out of 17 developmental goals in the 2030 Sustainable Development outlined by the United Nations. They are eradicating poverty (SDG1), ending hunger and promoting sustainable agriculture (SDG2), promoting health and well-being (SDG3), achieving gender equality and economic empowerment of women (SDG5), promoting economic growth and jobs (SDG8), supporting industry, innovation, and infrastructure (SDG9), and reducing inequality (SDG10). Therefore, financial inclusion and sustainable development have become two development objectives with far-reaching beneficial consequences for society and the environment.

1.2 Problem Statements

The significance of financial inclusion is conceptually and theoretically acknowledged. For the past decade, financial inclusion has received increased attention worldwide as countries are seeking solutions that ensure access to financial services that help their people to take control of their finances. Financial inclusion connotes not only getting money, credit, and financial services into the hands of the underprivileged or vulnerable population but also making certain that they are affordable and adequate for society as a whole.

To this end, a theoretical guide to measuring financial inclusion is yet adequately developed. Supply-side-oriented indicators provide information about financial institutions' characteristics, such as their access, penetration, or usage of the financial services they offer. Meanwhile, demand-side indicators help researchers understand the users' financial needs and how socio-economic and demographic characteristics shape their financial behaviour. The finance literature has long related finance to several macroeconomics variables, like gross domestic product (GDP) per capita, productivity growth, and global trade volume by measuring financial depth, proxied by money supply indicators like M2/GDP, or development indicators proxied by Private Credit to GDP. However, these indicators illustrate only the total size of the financial system rather than the distribution of its services.

The International Year of Microcredit 2005 hinted at the problem of data scarcity in measuring financial inclusion. The World Bank made the first attempt to collect proxy measures for financial inclusion like total branches of banking institutions, automatic teller machines (ATM), and the total number of loan and deposit accounts standardised by population division (Beck et al., 2007). In addition, current literature has set out a total of 3 dimensions of financial inclusion: accessibility to banking institutions, availability of banking branches, and usage of financial services. The first study to construct an FI Index for India using only a single indicator in each dimension was done by Sarma (2008). However, as mentioned, a single indicator communicates incomplete information and can cause financial inclusivity to be misinterpreted.

A composite measure comprising multiple aspects of financial inclusion is likely to represent the actual scenario better.

In the existing literature, proxy indicators such as percentage of deposit accounts with commercial banks (Ogbeide & Igbinigie, 2019), percentage of loan accounts from commercial banks (Wakilat & Nathaniel, 2020), percentage of credit cards (Bird et al., 1997), and insurance density (Ambarkhane et al., 2016) are widely used for availability of financial services. For accessibility of banking institutions, the common proxy indicators are percentage of automated teller machines (ATMs) (Lenka & Bairwa, 2016) and percentage of insurance corporations. In comparison, percentage of outstanding loans from commercial banks (Warue, 2013), percentage of outstanding deposits with commercial banks (Demir et al., 2020), and insurance penetration (Zhu et al., 2018) are used for the usage of financial services.

Meanwhile, studies focusing on the demand side of financial inclusion have included other aspects of financial services and socio-economic factors in its fold. Triki and Faye (2013) posited that in addition to access, an in-depth notion of financial inclusion should focus on the frequency consumers use the services and ensure that the quality of services is up to the standard that best serves the consumers' interests. Arora (2010) combined socio-economic and financial access indices to thoroughly picture a country's financial inclusion levels. Although it is reasonably assumed that human development plays a complementary role in the FI Index's indices, its role in financial inclusion is limited in the literature.

Similarly, Datta and Singh (2019) highlighted that greater health-related achievements and better educational attainment are important in raising awareness of and access to financial opportunities, enabling increased resilience for low-income groups. They suggested that a broader analysis of financial inclusion that accounts for the financial aspects and socio-economic dimensions is required to understand the extent of financial inclusion in developing regions. Although demand-oriented financial inclusion is an emerging theme in financial inclusion literature, the current literature momentum leans towards supply-oriented data in measuring financial inclusion.

According to the World Bank, insurance is an integral part of financial inclusion that is implicitly relevant in achieving multiple SDGs. Well-designed insurance products allow individuals to mitigate unanticipated external shocks, maintain their assets, and be involved in risk-taking production. They make society more resilient and less vulnerable, indirectly benefiting socio-economic growth. Financial inclusion that fails to account for insurance makes individuals and households more rigid and insecure, indirectly threatening the stability of socio-economic development. Hence, in examining the roles of banks and credit access on financial inclusion (Brown et al., 2016; Kochar, 2018), several studies have also broadened to include the role of insurance in achieving sustainable development. They found evidence that expanding financial outreach and financial usage in banking and insurance services are crucial in reducing global poverty.

The existing literature has focused heavily on banking services (payments, savings, and credit) in computing their FI index. Insurance, however, while being an important part of the financial services continuum providing protections to the population in managing unexpected financial losses, and emphasised by the World Bank (2021) as one of the drivers in promoting greater financial inclusion, has not been given sufficient attention, let alone understanding how life and non-life insurance come into picture differently. For example, Beck et al., 2007; Sarma (2008); Chima et al. (2021) included only banking indicators in their FI index. Other studies like Zhu et al. (2018) only considered the number of insurance institutions per 10,000 people as their proxy indicator, whereas Kanga et al. (2021) only accounted for the total insurance premium. According to Demir et al. (2022), the choices of proxies in different dimensions can influence the casualty in the finance–sustainability nexus.

An absence of a standardised measure in the existing literature that accounts for the role of insurance in the existing FI index presents a pitfall that distorts the understanding of insurance-related problems in promoting financial inclusiveness. A major difference between life and non-life insurance is that life insurance can increase productivity by reducing the demand for liquidity and steering the resources to their productive use. Meanwhile, non-life insurance covers the monetary compensation for non-living assets, including property, vehicles, and travel. As both types of insurance have their respective functions and are designed to protect against different types of risks, breaking them down is important to provide a detailed overview of the contribution of different insurance genres to financial inclusion.

In addition, there is a greater appreciation that financial inclusion plays a complementary role in sustainable development. According to Asongu et al. (2020), financial inclusion is a promising instrument to reduce economic inequality as a global movement by creating more earning opportunities through employment creation and economic stability. Recent findings have also uncovered financial inclusion's role in boosting economic growth (Rupeika-Apoga, 2014; Demirgüç-Kunt et al., 2008; King & Levine, 1993; Levine, 2005). Ofori-Abebrese et al. (2020) reported that most SSA countries have low financial inclusion levels. Their recommendation was to promote financial inclusion with evidence that financial inclusion positively impacts welfare development.

To achieve sustainable development in Asia, Ratnawati (2020) revealed the impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in several Asian countries. They showed that all dimensions of financial inclusion significantly impact economic growth, poverty, income inequality, and financial stability. However, the impact of financial inclusion on sustainable development among Asian countries is far from optimal. Their study suggested that the countries reinforce their strategic focus on piloting financial inclusion policies for sustainable development and higher social welfare to become possible.

Consensus is built on the view that as the prerequisite of sustainable and inclusive economic growth, financial inclusion is attainable only when the economically weaker sections of the population are brought on par with the

better-off ones in terms of their financial accessibility, availability, and usage. Debates have emerged concerning the impact of financial inclusion on sustainable development. Understanding how financial inclusion relates to sustainability is crucial for policymakers to assess the direct and indirect impacts of financial policies on various aspects of sustainable development.

Although many studies postulate the relationship between financial inclusion and sustainable development, most focus only on certain aspects, e.g. poverty, inequality, and growth. A study that encompasses every finance-related aspect of sustainable development to paint a comprehensive overview of how financial inclusion and sustainable development interact with each other is yet established. The findings would furnish policymakers and industry players with robust and solid evidence over the debate on the relationship between financial inclusion and sustainable development.

1.3 Research Questions

This study aims to address research questions as follows.

i.   Do life and non-life insurance contribute to higher financial inclusion?

ii.   What is the relationship between the insurance-adjusted Financial Inclusion Index (FI index) and the 7 finance-related aspects of Sustainable Development Goals (SDGs)?

1.4 Research Objectives

The general objective of this study is to study the role of insurance in financial inclusion to achieve sustainable development. The specific objectives are as follows:

   i.   To compute a multidimensional Financial Inclusion Index (FI Index) by incorporating the role of life and non-life insurance.

   ii.   To examine the relationship between the insurance-adjusted Financial Inclusion Index (FI Index) and 7 finance-related aspects of Sustainable Development Goals (SDGs).

1.5 Significance of the Study

In seeking ways to advance financial inclusivity, the role of insurance is largely overlooked by both academicians and policymakers. To date, only 17 of 36 jurisdictions in the Alliance for Financial Inclusion (AFI) have included insurance as a central pillar in their national financial inclusion strategy (NFIS) due to a lack of understanding and guidance. The first objective of this study is to address the lack of a harmonised and all-inclusive index that accounts for the role of life and non-life insurance in measuring the financial inclusion level across countries. This study computes a composite index using incorporating both banking and insurance services, where assessments and comparisons are made at the international level. It points out the potential of insurance services as part of the financial inclusion strategies to address the financial sector and

avoid overreliance on the banking industry, which could be more volatile and riskier amidst uncertain times.

Besides, there is limited empirical research on the impact of financial inclusion on overall sustainable development. Most previous studies only analyse the relationship between financial inclusion and particular aspects of sustainable development, namely poverty (Tran & Le, 2021), agricultural sustainability (Gang et al., 2020; Abu & Issahaku, 2017), well-being (Raza et al., 2019; Matekenya et al., 2020), gender equality (Zhang & Posso, 2017; Ohiomu & Ogbeide-Osaretin, 2019), economic growth (Naceur & Ghazounai, 2007; Van et al., 2019), innovation and infrastructure (Demirguc-Kunt et al., 2018; Allard & Williams, 2020), and inequality (García-Herrero & Turégano, 2015). This study enriches the literature by evaluating the individual and the overall impact of financial inclusion on sustainable development and provides robust evidence for the hypothesis posted by WorldBank. The findings provide a new lens for policymakers, regulators, and academicians to revisit the relationship between financial inclusion and sustainable development.

The contributions to the literature are as follows. Firstly, this study computes a few sets of financial inclusion indices with banking and insurance services indicators. The findings show that insurance complements banking services in advancing financial inclusion, hence greater emphasis should be given to insurance in formulating financial inclusion policies. In addition, this study breaks insurance down into life and non-life insurance in financial inclusion measures. The findings indicate a lack of contribution of insurance to

financial inclusion, especially life insurance. The findings are imperative as it allows resources to be directed to areas with the greatest impact, hence encouraging economic efficiency. Last but not least, the findings concerning the relationship between financial inclusion and sustainable development provide new avenues to arrive at sustainability.

1.6 Chapter Layout

This study's remainder is presented: Chapter 2 discusses the literature review that constructs the independent and dependent variables. Chapter 3 presents the data, variables, and methodologies used in the study. Chapter 4 elaborates on the empirical findings of this study. Lastly, chapter 5 concludes the study.

1.7 Summary

The main highlights of chapter 1 are summarised in Table 1.1.

Table 1.1: Summary of Chapter 1

The objective of this study	Current literature (Issues)	Significance/Contribution of this study
To compute a multidimensional Financial Inclusion Index (FI Index) by incorporating the role of life and non-life insurance	In a survey report by Alliance for Financial Inclusion (2010), out of 36 representatives from the central bank of the 36 countries, only 17 representatives responded that insurance services had been integrated into their financial inclusion.	The findings provide new insights by considering different genres of insurance, *i.e.* life and non-life insurance, as part of the financial inclusion in enabling sustainable development.
	Expanding financial outreach and financial usage in banking and insurance services are equally crucial in achieving sustainable development (Brown et al., 2016).	
To investigate the relationship between the insurance-adjusted Financial Inclusion Index (FI Index) and 7 finance-related aspects of Sustainable Development Goals (SDGs).	Financial inclusion and the attendant expansion of its facilities are positioned prominently as a veritable tool to achieve other developmental goals in the 2030 Sustainable Development Goals by covering 7 out of 17 goals outlined by the United Nations (Khmous & Besim, 2020).	This research provides evidence on the effect of financial inclusion on 7 aspects of Sustainable Development Goals (SDGs) (as a guide while assessing the country's overall finance-driven sustainability)

Source: Author's own summarisation

Figure 1.1 Research framework on computing an insurance-adjusted Financial Inclusion Index (FI index) and its relationship with the 7 finance-related aspects of Sustainable Development Goals (SDGs).

Objective 1: Computation of Financial Inclusion Index (FI index)

Objective 2: Financial Inclusion and Sustainable Development

Banking-related indicators:

Loans

Deposits

Automated teller machines (ATM)

Credit Cards

Insurance-related indicators:

Life insurance

Non-life insurance

Financial Inclusion Index Dimensions:

Availability

Accessibility

Usage

Related Factors:

Inflation

Interest rate

Population

Trade

Sustainable Development Goal (SDG) Index:

Poverty reduction

Agricultural sustainability & ending hunger

Health & well-being

Gender equality

Economic growth

Industry, innovation, and infrastructure

Inequality

CHAPTER 2

THEORETICAL FRAMEWORK & LITERATURE REVIEW

2.0 Introduction

First, section 2.1 elaborates on the theories underlying financial inclusion incorporating insurance and how it relates to the 7 SDGs as indicated by the World Bank. Next, section 2.2 presents the literature review that provides an empirical review of the existing literature on how financial inclusion is measured, the role of life and non-life insurance in financial inclusion, and the relationship between financial inclusion and sustainable development, establishing the ground for this study. The hypotheses developed for this study are formulated accordingly. Section 2.3 provides a summary of this chapter.

2.1 Theoretical Framework

This section discusses the theory that illustrates the importance of insurance in financial inclusion and its relation to sustainable development. Then, it extends the underlying theories to the 7 finance-driven SDGs as indicated by the World Bank, namely eradicating poverty (SDG1), ending hunger and promoting sustainable agriculture (SDG2), promoting health and well-being (SDG3), achieving gender equality and economic empowerment of women (SDG5),

promoting economic growth and jobs (SDG8), supporting industry, innovation, and infrastructure (SDG9) as well as reducing inequality (SDG10).

2.1.1 Institutional Intervention Theory (Why insurance matters?)

Institutions are defined as human-created limitations that organise human behaviour. The main role of institutions is to reduce uncertainty felt by individuals and firms. As a consequence, it is probable to influence the actions of people toward insurance consumption choices. As life is full of uncertainties, insurance plays a critical role in protecting people from potential risks without suffering a loss. Besides, insurance companies are crucial to uphold the financial system's stability as they are sophisticated investors in the financial market. The growing links between insurers and banks also imply that insurers are the mediators for individuals and companies to minimise their risks.

Insurance matters to sustainable development as it fills the gaps in social safety nets, enhances working conditions, and prevents individuals from going into poverty. When integrated with other financial tools, it is more useful. For instance, when insurance comes with savings, loans, payments, and remittances, it helps individuals build their financial health and help businesses to expand. Alongside risk reduction measures, it promotes more sustainable farming, housing, and living conditions. Insurance can also be customised to specifically cover, for example, specific risks faced by different individuals. At a higher level, insurance builds the resilience of governments.

2.1.2 Institutional Theory (SDG1)

The institutional theory was used by Seman (2016) to explain how financial inclusion relates to eradicating poverty. The institutional theory describes how institutions are shaped, maintained, changed, and dissolved (Scott, 2005). The absence of financial inclusion results in a broken social elevator. Principally, institutional theory portrays that the existing economic system may be designed to prevent the poor from escaping poverty irrespective of their capability and competitiveness. Only structural changes, for instance, rules, routines, and norms, that enhance financial inclusion can help individuals unleash their unique talents and offer them social and economic mobility.

The institutionalists further argue that the shortage of funds is non-existent in the economy, and the hindrances to the financial sector development are caused mainly by the ability to move money, also known as the velocity of money. In other words, an increase in the velocity of money will amplify access to finance in an economy. Institutional voids, rigid administration, bureaucratic bottlenecks, and poor contract enforcement are the most cited causes that defer the velocity of money (Ramsaran, 1992; Leão, 2005). Thus, emphasising institutional quality, increasing regulatory flexibility, remedying bureaucratic dysfunction, and strengthening contract enforcement can increase the velocity of the money supply and foster financial inclusion.

Greater access to finance will stimulate the poor with talents to embrace entrepreneurship in the form of small and medium enterprises (SMEs). In

wealth accumulation, entrepreneurs can reinvest in their businesses by ploughing a portion of their earnings back to reward the shareholders and create sustainable income for themselves. In sum, institutionalists believe that a finely tuned financial market can facilitate SME development and higher employment, leading to substantial poverty reduction.

A similar applies to insurance. It saves people from the poverty trap. This is because the financially vulnerable groups often assume occupations that are lower paid and have higher risks. For them, an illness, death, an accident, a fire, or a natural disaster is much more damaging, compared to a counterpart who has enough savings or a stable income to buffer the sudden expenditure. Insurance can alleviate this by providing a contractually enforceable pay-out when such an event happens – the key advantage of formal insurance over informal insurance. For instance, health insurance can help cover medical costs, a common reason why people fall into poverty. Agriculture insurance can help tide farmers through crop failures. When used in conjunction with other tools such as savings, loans, and income generation, insurance can build financial health and resilience.

2.1.3 Solow Economic Growth Theory (SDG2)

Chima et al. (2021) used Solow's economic growth theory to relate financial inclusion to agricultural sustainability and ending hunger. Solow's economic growth theory was first introduced by Swan (1956) and Solow (1957) to determine the underlying factors of the varying economic growth rates across

countries. The theory illustrates capital accumulation as a component of economic growth and concludes that the capital and output of an economy will gravitate towards a steady-state equilibrium in the long run regardless of its initial level. According to this theory, technological progress can promote growth by accumulating more capital, labour inputs, and productivity.

Efobi et al. (2014) identified financial inclusion as an instrument that allows individuals to access formal financial services such as lending, savings, and payment services, enabling continued capital accumulation and engaging them in agricultural production. In Solow's growth theory, the accumulated capital investment in agricultural production and improvement in modern machines increases agricultural yields and improves farmers' income, thus reducing undernourishment.

Besides, financial inclusion makes farmers less sensitive to the consequences of external shocks, thereby lowering the possibility of liquidating their productive assets such as crops, livestock, and equipment, which would otherwise create a vicious cycle of poverty. Lastly, financial inclusion can impact the undernourished, even if their access to finance is unchanged. Improving agricultural productivity will increase crop production and lower crop prices, benefiting everyone, whether they come from the agricultural sector. Similarly, to the extent financial inclusion increases the overall income of agricultural workers, undernourishment will decline.

Insurance can support risk management in the food production value chain, thereby being a key component of measures to achieve food security. The UN World Food Programme notes that smallholder farmers produce most of the world's food but tend to be food insecure themselves. Agricultural insurance can help smallholder farmers build resilience against losses from adverse events, while also strengthening access to credit and incentivising investment. Business interruption insurance can cover disruptions in food processing and transportation. Property insurance can protect food production facilities and their own homes.

2.1.4 Public Good Theory and Capability Theory (SDG3)

Ozili (2020) used the public good theory, whereas Kuriakose and Iyer (2015) used the capability theory to relate financial inclusion to health and well-being. The public good theory was first proposed by Samuelson (1954), stating that a public good is a good that is non-excludable and non-rivalrous where no user can be excluded from its use, and the availability for others cannot be reduced. Considering financial services as a public good has two implications. Firstly, formal financial services can be delivered to the entire population; secondly, access to finance for everyone is unrestricted. Formal financial services are accessible to all as a public good, and none can be excluded. All members of society would enjoy the same full suite of quality financial services without having to pay for them. Under this theory, all members of society are beneficiaries of the financial system, with no exception. This theory reiterates the contention of Swamy (2014), who claimed that financial inclusion outcomes

must benefit a segment and society as a whole. This way, the financial gap between different income groups would be mitigated.

Based on the public good theory, the capability theory by Sen (1984) suggests that by equipping individuals with appropriate financial instruments and adequate financial knowledge, financial inclusion would widen individuals' freedom to make financial decisions that best fit their needs and pursue their well-being goals. Universal access to finance allows individuals to make choices based on their essential needs, such as improved water and sanitation, quality medical care, education, and better mentality, culminating in good population health and well-being.

Insurance also supports good health outcomes. Health insurance lowers the barriers to getting sufficient and quality healthcare. Insured individuals are freed from out-of-pocket health expenditures. It is generally accepted that compulsory, pooled prepaid schemes are the most effective way forward for ensuring low-income individuals have access to healthcare. Importantly, the increasing use of digital technology in health insurance has further reinforced its role in promoting good health outcomes. Innovations such as telemedicine have helped expand access to healthcare, as have devices that track health data and reward policyholders for healthy habits. Beyond the individual level, insurance can contribute to better healthcare systems through products that support risk management along with the health delivery value.

2.1.5 Vulnerable Group Theory and Integrationist Approach (SDG4)

Ozili (2020) used vulnerable group theory, while Kumar and Kamaiah (2014) used an integrationist approach to relate financial inclusion to gender equality. The vulnerable group theory argues that any country's financial inclusion frameworks or projects must be directed to vulnerable populations disproportionately affected by prejudice and discrimination, such as the economically disadvantaged, racial and ethnic minorities, youth, the elderly, and women. Like other industries, biases and conventional banking methods are blind to gender gaps.

In general, women face more hurdles than men in their access to finance because of low credit scores or a lack of traditional collateral. Apart from being more likely to be prevented from loan approval than men, female borrowers pay relatively higher interest rates on their bank loans than male borrowers (Alesina et al., 2013), although no evidence found that women engage in more risk-taking behaviour than men. Hence, in a gender-exclusive financial system, women are forced to rely on internal resources or family support to receive education or expand their growth opportunities (Kuada, 2009). However, the distribution of resources among the family members is often unequal due to social preference and gender expectations.

According to the integrationist approach by Levitas (1998), to overcome the problem of financial exclusion, it is crucial to provide women with equal opportunities to participate in formal work in the labour market. Women's

participation in the formal labour market can only be achieved if they are equipped with specific skills that align with the demand for labour. Once women become part of the labour force, their income would become more stable, enabling them to access various financial products. Besides, the integrationist approach argues that an inclusive education system must provide women with equal educational opportunities to increase their financial literacy. Given the rapidly-changing financial landscape, financial literacy is important to help women understand financial concepts and make effective decisions that best meet their interests.

Insurers can support gender equality by offering products and business models that consider gender differences, thereby increasing the uptake of insurance by women and strengthening women's ability to participate in the labour force. Men and women normally work in different employment sectors, and women often work in more vulnerable sectors. Most single parents in the world are also women. Such gender roles, on top of biological differences, shape the risks that women face – and insurers can play their part by being sensitive to the diversity of needs. For instance, insurers can ensure the availability of health insurance that covers sexual- and reproductive-health services. In countries where there are stark gaps in personal freedoms, insurers can design distribution models that are more accessible for women.

2.1.6 Modern Development Theory (SDG8)

Modern development theory strongly advocates that financial inclusion is a driving force toward economic growth and vice versa. The relation can be explained by the supply-leading or demand-following channels (Mohan, 2006). In a supply-leading channel, once the financial system adequately meets the financial needs of people, the resulting economic entitlements and empowerment of the individuals set a direct path to reinforce financial deepening. Meanwhile, the demand-oriented view argues that when individuals actively engage in various economic activities, they earn a stable income and reduce the unemployment rate. The soaring demand for financial products and services will urge the financial system to expand. The development of the financial sector via its services contributes to capital formation and encourages innovation, efficiency, and investment, which fosters growth output. Goldsmith (1969) further stressed that the financial system accelerates economic growth.

A similar assertion was made by King and Levine (1993), highlighting capital accumulation and technological innovation as the pathways of how the financial system influences growth. A well-established financial system induces information-gathering and intelligence-sharing networks, which increases the financial system's capacity to support the productive activities of businesses and individuals at the margins. Besides, expanding external finance sources to SMEs increases the overall competitiveness of the market by giving chances to new entrants, presenting a way finance promotes entrepreneurship and productivity. Meanwhile, the funds available in a country with an

underdeveloped financial system are limited and more expensive. Hence, fewer economic activities could be financed and lower the resulting growth. In short, the theory depicts financial inclusion to influence economic growth positively. The theory is valid, looking at the notable industrial growth and fast-paced growth in bank credit in the global economy.

Insurance is equally important in fostering business resilience and stimulating business investments, thereby, contributing to the growth of companies. Covers such as fire, flood, and business interruption insurance allow businesses to operate and pay their employees despite the financial difficulties. Insurance facilitates access to credit so that businesses, whether a shipping conglomerate or a mom-and-pop shop, could invest in more assets, technology, and research and development, which allows them to innovate, update and expand their business and, consequently, create new jobs.

2.1.7 Special Agent Theory and Life-Cycle Theory (SDG9)

The special agent theory by Ozili (2020) explains the linkage between financial inclusion and industry, innovation, and infrastructure. The special agent theory states that the process of delivering financial services to the poor and socially excluded populations is complicated and requires technical skills that match the demand of a community, inhabitants, and geographical characteristics. Thus, special agents with expertise must complement the financial inclusion programs targeted at these excluded members.

The theory expects the special agent to be: (i) adequately trained and well versed, (ii) have a thorough understanding of the characteristics of the excluded members, and (iii) aware of how the excluded members access the informal financial system that is viewed as a substitute for the formal one, and (iv) able design a framework to integrate both formal and informal financial system. A special agent can be a community bank, non-banking financial institution, or special agencies like financial technology (Fintech) companies or technological start-ups that technically make financial inclusion feasible and hence, support the industry development.

Khraisha and Arthur (2018) used life-cycle theory to explain the linkage between financial inclusion and industry, innovation, and infrastructure. The life-cycle theory by Modigliani and Brumberg (1954) explains how finance-led innovation works. Latent demand for special agents induces the finance industry to actively embrace technologies like artificial intelligence (AI) and the Internet of Things (IoT) to fill the financial gap while retaining competitiveness. Besides, financial institutions seek ways to become more efficient in their core competencies and diversify their product offerings to cater to ever-changing financial needs. Contrarily, innovation drives the financial system toward a predefined goal - "an idealised target of full efficiency" and "toward the theoretically limiting case of zero marginal transaction costs and dynamically complete markets" (Merton, 1995). The development of finance through innovations promotes savings and channels these resources to their most productive uses, undergirding the development of other industries.

Insurance helps assume and diversify risks faced by large, medium, and small businesses and mega infrastructure projects. Particularly in developing countries, insurance helps to increase the access of small-scale businesses to the formal financial system and helps them to integrate into value chains. Insurance provides support for the development of technology, research, and innovation by taking on the associated risks as well as through investment. Through its risk management requirements, insurance protects and promotes sustainable industrialisation and quality infrastructure.

2.1.8 Public Money Theory and Private Money Theory (SDG10 – Reducing Inequality)

Public money theory and private money theory were proposed by Ozili (2020) to explain the linkage between financial inclusion and inequality. Public money theory suggests exclusive programs financed using public money are crucial to reducing inequality. This theory argues that government budgets should finance exclusive programs and activities. This is because governments can tax the higher income groups to generate funds for exclusive programs beneficial to all sections of society. As a result of the redistributive approach, the income inequality of the poorer sections of society and the excluded population can be minimised by expanding the benefits system and reducing earning differentials through the arms of taxation. Evidence illustrates that public funding plays a more critical role than private funding in driving financial inclusion (Dashi et al., 2013). Besides, financing exclusive programs using public funds can prevent the agent from placing his own goal before the program's goal.

In contrast, private money theory argues that exclusive programs financed using private funds are more conducive to reducing inequality. This is because private funders have the accountability to ensure that their funds are used efficiently in delivering the intended financial products and services to the excluded members. The stance is that when private funders dominate the exclusive programs, their income and profit are directly related to the projects' performance. Thus, they are incentivised to offer exceptional creativity and innovation in project and risk management to achieve public objectives while maximising their benefits.

Insurance is an instrument to reduce inequality by supporting the incomes of individuals and households that suffer shocks. Insurance can raise economic growth by managing risks and saving lives by encouraging risk mitigation. By enhancing individuals' and households' predictability of outcomes, insurance can enable more complex economic interactions. As insurance supports improved decision-making, it can result in a more equitable distribution of the resulting gains.

2.2 Literature Review

2.2.1 Financial Inclusion Measurement

Similar to the definition of financial inclusion, existing studies use different methodologies to measure the financial inclusion level of their sample countries. While approaches to measure financial inclusion vary across studies, there is

consensus that a good financial inclusion measurement should satisfy criteria like (i) the ability to embody multiple dimensions of financial inclusion, (ii) uncomplicated calculations, and (iii) the cross-country comparability (Chattopadhyay, 2011). Beck et al. (2007) were one of the first studies to measure financial inclusion at the country level. They constructed two dimensions of financial inclusion: access and use of financial services, and incorporated new indicators for services like deposits, loans, and payments.

Unlike Beck et al. (2007), Honohan (2008) measured financial inclusion in a cross-country study by estimating only the adult population who own a bank account and did not account for various dimensions of financial inclusion. Although effectively measuring a specific aspect of financial inclusion - banking penetration; a serious defect is identified as it fails to consider other key features of an inclusive financial system, such as usability and accessibility of the financial services (Sarma, 2015).

Financial inclusion indicators are crucial in measuring certain aspects of financial services, but when used alone, they communicate only partial and incomplete information and impair the comprehensive evaluation of a financial system. Other researchers (Allen et al., 2016) also opined that mere possession of a bank account alone could not represent financial inclusion under psychological or physical barriers like geographical issues that prevent people from using those accounts. Hence, later studies adopt different dimensions of financial inclusion, including their respective indicators. The most widely used

indicators in recent literature are the number of bank branches, number of ATMs, amount of bank credit, and bank deposits.

Financial inclusion is an unobservable concept that is difficult to be quantitatively measured. However, it can be determined by the interaction of its relevant variables. Hence, most studies that evaluate the development of financial inclusion measured it using a multidimensional FI index by compiling relevant indicators into a composite index because it contains information from various dimensions and makes financial access performance across different countries comparable using the ranking method.

It is noteworthy that two critical issues in using an FI index to estimate the latent variables must be addressed: selecting relevant causal variables and estimating parameters (weights). For the first issue, applying a standard reduction of information criterion approaches to select variables is impossible. Hence, variable selection must rely on existing literature and theories. Secondly, since financial inclusion cannot be quantified, standard regression techniques are inadequate to measure its parameters. Thus, financial inclusion measurement relies on the weight assigned to the respective indicators or dimensions to maximise the information from an existing data set. The main approaches to measuring financial inclusion by developing a composite FI index are non-parametric and parametric methods.

2.2.1.1 Non-parametric Method

Sarma (2008) was the first to compute a multidimensional FI index using a non-parametric method. This method is similar to the United Nations Development Programme (UNDP) for computing the well-known human development index (HDI) and gender development index (GDI). The paper's computation of the FI index involves a three-step process: (1) identify dimensions and select their relevant indicators, (2) normalise the selected indicators so that they are comparable, and (3) assign appropriate weights to each dimension and their indicators before aggregating them into a single FI index. First, the author defined three dimensions of financial inclusion - availability, usage, and banking penetration and obtained indicators for each dimension. Then, the author combined the indicators into a single index for 49 countries in a year. The paper's FI index was computed using the normalised inverse Euclidean distance.

A distance-based approach is methodologically improved than the United Nations Development Programm's (UNDP) methodology, which uses a simple average to compute dimension indices and assumes perfect substitutability across dimensions. In UNDP's methodology, a unit decrease in one dimension can be fully compensated by a unit increase in equal (contingent upon arithmetic average) or proportional (contingent upon geometric average) magnitude of another dimension. In this case, the actual weights for each dimension can be eventually unequal if more indicators are incorporated for one dimension than the others. Besides, a Euclidean distance method is convenient

for the computation of an FI index and satisfies essential mathematical properties like boundedness, unit-free measure, homogeneity, and monotonicity.

However, a methodological shortcoming of using a non-parametric method in computing an FI index is that it determines the importance of dimensions and indicators through exogenous weight assignment, following researchers' discretion. Subjective weight assignment based solely on the researchers' assumption regarding the importance of financial inclusion can make the index computation process arbitrary. The presumption that all parameters have the same effect on financial inclusion may be justified on theoretical or policy grounds for certain occasions but not always. Besides, when outliers are present in the financial inclusion data, the overall FI index's indices can become unintended benchmarks.

Sarma's (2008) methodology in FI index computation has attracted considerable attention from scholars that study financial inclusion, although the dimensions used diverge across different studies. Inspired by Sarma (2008), Park and Mercado (2015) developed a similar composite index using the inverse Euclidean distance. Unlike Sarma (2008), who used only a single year of data, they averaged their sample period to seven years to compute their financial inclusion indicators and expanded their sample size to 180 countries. The countries are then ranked following their financial inclusion level for comparison purposes. Based on Sarma's (2008) and Park and Mercado's (2015) framework, Wang and Guan (2017) computed their FI index based on the

accessibility and usability of financial services, and the weights are drawn from the coefficient of variation (CV) in the analysis.

2.2.1.2 Parametric Method – Principal Component Analysis (PCA)

Many researchers believe a good composite index should encompass all the necessary information from the indicators but must not be biased toward any of them. Besides, evidence has shown that indices are sensitive to the subjective weighing approach since any weight change can greatly affect the results (Lockwood, 2001). As a result, other studies rely on parametric methods in which the weight assignment process is less arbitrary to compute their FI index (Cámara & Tuesta, 2014). Principal Component Analysis (PCA) is one of the most commonly used methods due to its endogenous weight assignment nature and its ability to address the methodological issues of potential bias, lack of scientific rigour, and multicollinearity problems.

PCA is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The number of principal components is less than or equal to the number of original variables. This transformation is defined so that the first principal component has the largest possible variance (that is, it accounts for as much of the variability in the data as possible). Each succeeding component, in turn, has the highest variance possible under the constraint that it is orthogonal to (*i.e.*, uncorrelated with) the preceding components.

Cámara and Tuesta's (2014) analysis combined the indicators of three dimensions to compute an FI index by applying a two-stage PCA. They used PCA to estimate three dimensions (usage, access, and barriers) in the first stage before computing their FI index. In the second stage, the indicators obtained are used as causal variables to estimate the weights for three dimensions and the overall FI index. It was the first attempt in the literature to compute a composite index that used a demand-side data set at an individual level to measure the level of financial inclusion across countries.

2.2.1.3 Parametric Method – Factor Analysis (FA)

Amidžić et al. (2014) were the first to employ factor analysis (FA) to compute their FI index following a five-step sequence. Following the UNDP's approach, normalisation is applied to the variables to ensure that the scale on which the variables are measured is irrelevant. Secondly, they introduced a statistical identification of each dimension to verify if the statistical groups obtained from FA are the same as depicted by theory. Given that the statistical dimensions matched the theoretical dimensions, they then used the statistical properties of the dataset in the third step to assign weights to the causal variables and their respective indices. Finally, different from the UNDP's indices which are computed using a simple geometric mean, based on the outcomes of the second and third steps, they chose a weighted geometric average in the fourth and fifth steps as the functional form of the aggregator for the computation of the dimension and composite indices, respectively.

However, a drawback of this approach is that the FA method reduces a set of variables to a smaller number of factors and, therefore, does not fully utilise all available data for a country. As a result of an absence of reliable and available data, they did not include their defined proxies for a quality measure in their composite indicator. On top of that, the FA method has several assumptions to be fulfilled, such as selecting the underlying number of common factors (Steiger, 1979).

2.2.2 Role of Insurance in Financial Inclusion

The measurements of financial inclusion are different not only in their approach, but the indicators to compute the FI index also deviate from each other. Recent studies recognised that apart from the dimensions of penetration, usage, and accessibility of financial inclusion, the types of financial services are unequivocally crucial in enabling an inclusive financial system. The basic financial services available in the market are payments, savings, credit, and insurance. Banking services have long been a question at heart in financial inclusion. Later, the studies like Hou and Cheng (2017) further pointed out the importance of non-banking financial products, such as insurance, stocks, and mutual funds, in upholding development. Kumar et al. (2020) also called for future studies to not only focus on banking products, but also consider other products such as insurance, pension, and remittances.

Individuals and households in developing countries are vulnerable due to their exposure to both idiosyncratic and covariate shocks, resulting in loss of

income and welfare (Panda et al., 2020). Unfortunately, they do not have a coping mechanism to resolve these risks. Insurance as a coping mechanism has attracted considerable policy and research attention over the past decade, especially with the emergence of micro-level products, innovative forms of the insurance system, and sovereign risk schemes, which are assumed to be able to offer more reliable and effective protection that helps to enhance the risk planning and risk understanding of the population (Hallegatte, 2014). Today, the collaboration of the banking and insurance industry with proper risk-sharing management is necessary to support the initiatives to deliver financial services to the underprivileged.

However, only limited studies in the finance literature have emphasised the role of insurance in financial inclusion. For example, Zhu et al. (2018) included insurance indicators in their FI index for China, proxied by the number of insurance institutions per 10,000 people, number of insurance institutions per 10,000 square km, insurance density, and insurance depth. In computing their FI index, they found that the largest proportion of weights is attributed to the number of banking and securities institutions, whereas the weights of insurance are the smallest. The findings signified that the insurance industry did not contribute to financial inclusion as significantly as banking development in China due to the country's heavy reliance on banking sectors as sources of financing. The limited contribution of insurance to financial inclusion can be viewed as an opportunity for China's insurance providers as the insurance market is not as comeptitive as the banking sector.

At an international level, Han et al. (2010) found that insurance market development plays a more critical role in promoting financial inclusion in developing countries than in developed countries. Kanga et al. (2021) also included insurance, proxied by life- and non-life insurance premiums to GDP, in measuring the penetration dimension of financial inclusion. Their results suggested that financial institutions' depth consisting of insurance is favourable to economic growth in both the short- and long-run when interacting with Fintech. These results indicate that the importance of insurance can be fully reaped only when its position is brought on par with other financial services, especially banking sectors.

In the limited studies that incorporated the effect of insurance on financial inclusion, the effects of life and non-life insurance are not distinguished. Life and non-life insurance have different natures, with the former providing the investment fund for infrastructures like banks and insurance branches while providing a safety net for individuals and their households. At the same time, the latter is related to mandatory insurance schemes such as motor vehicle insurance aimed at reducing risk and channelling funds to encourage business activities throughout the economy (Lee & Lin, 2016). As both types of insurance have their respective functions and are designed to protect against different risks at different levels, it is then worth exploring the degree to which life and non-life insurance contribute to financial inclusion to provide a detailed overview of the contribution of different insurance genres in financial inclusion.

2.2.3 Financial Inclusion and Poverty Reduction (SDG 1)

A growing finance literature addresses the association between financial inclusion and poverty reduction using macro-level data at the state level (Burgess & Pande, 2005; Inoue & Hamori, 2012). For instance, Burgess and Pande (2005) used state-level rural bank panel data to investigate the impact of financial inclusion on poverty reduction. Their findings showed that state-led expansion of rural bank branches in India is conducive to poverty reduction. Another study in Indian states was carried out by Inoue and Hamori (2012) to examine the impact of financial deepening on poverty. Using credit and deposit amounts loaned out and received by the regional commercial banks, they unveiled financial deepening as an instrument for reducing poverty. These studies' exploitation of banking data was in line with the Indian government's primary objective of financial reform to induce an efficient and profitable banking system.

Other studies of identical subjects have used micro-level data to examine the implications of financial inclusion (Dimova & Adebowale, 2018; Aideyan, 2009). Their emphasis was on the effect of access to formal financial systems and microfinance on poverty-related issues in African countries where poverty is pervasive. Dimova and Adebowale (2018) used data from the General Household Survey for Nigeria and found evidence that access to finance does not alleviate income inequality but improves household welfare. Using survey data from 281 rural households, Aideyan (2009) found that households with

access to microfinance have better social and economic benefits than those without.

Apart from focusing on India and Nigeria as case studies, most studies on the finance-poverty nexus employed cross-country data to address this worldwide issue (Honohan, 2008; Tran & Le, 2021; Park & Mercado, 2015). Honohan (2008) tested the effects of his financial indicators on poverty reduction across 162 countries. His results showed that financial access negatively correlates with poverty. However, the correlation between them highly depends on the specification used, *i.e.*, when the financial inclusion variable proxied by a financial depth measure is used, the result is significant but loses its significance when the gross domestic product (GDP) per capita is added as a dummy variable. Therefore, the role of financial inclusion in poverty alleviation can be conditional. The findings further reinforced the notion that poverty is not merely the absence of income to satisfy basic needs but deprives basic human capabilities (Sen, 1992).

Similar results were reported by Tran and Le (2021) for developed countries in the European region and Park and Mercado (2015) for developing countries in Asia. They found that financial inclusion benefits the poor and vulnerable groups by improving their financial position through access to a wide range of essential financial services such as savings, credit and insurance. They further uncovered that the correlation could be strengthened through higher education and income. The findings align with Grohmann, Klühs & Menkhoff

(2018), which show that infrastructure and literacy complement financial inclusion.

As part of financial inclusion, similar results were revealed for the role of different genres of insurance in poverty reduction by other studies (Liu, 2021; Aryeetey et al., 2016; Ferrarini et al., 2014). Liu (2020) found that income protection insurance as a special insurance form helps economies escape poverty when the coverage is optimal. In the same vein, an increase in the generosity of unemployment insurance cultivates lower poverty rates and improvements in healthcare outcomes (Ferrarini et al., 2014). A social insurance program is important in helping individuals through economic hardship when they lose their source of income (Renahy et al., 2018).

In Ghana, Aryeetey et al. (2016) revealed the significance of health insurance in reducing out-of-pocket expenditure (OOPE), catastrophic expenditure (CE), and poverty. Health insurance coverage increases the propensity to use private sector healthcare providers without placing a financial burden on poor households (Sriram & Khan, 2020). These results suggest that policies aiming to close the disparities in insurance rates to achieve optimal coverage for growth would reduce poverty. Previous findings point to the importance of the insurance industry in reducing poverty apart from the banking industry. As such, the following hypothesis is derived:

H1$_a$: There is no significant relationship between financial inclusion and poverty reduction.

H1$_b$: There is a significant relationship between financial inclusion and poverty reduction.

2.2.4 Financial Inclusion and Ending Hunger (SDG 2)

Sustainable agricultural development is recognised by Antle and Diagana (2003) as a key element in combating poverty and environmental deterioration. An inclusive financial system has been attracting more recognition as a mechanism that incentivises sustainable agricultural practice by reshaping the agricultural system into models with high specialisation, concentration, and economies of scale. Cai et al. (2021) found a positive impact of expanding credit on changing the smallholder farming system into large-scale agricultural production in China. In the same vein, Peng and Xu (2019) showed that financial inclusion and agricultural industrialisation mutually support each other, suggesting that an inclusive financial system helps industrialise agricultural production. Financial resources necessary for modernised agricultural production made available to smallholding farmers help them adopt innovative technologies in their work (Miller & Jones, 2010).

Studies have used different measurements of agricultural sustainability when examining the implications of financial inclusion. For example, Gang et al. (2020) revealed a long-term cointegration between value-added agriculture productivity, domestic private sector credit, broad money, cropped area, and

labour force in Pakistan. They further concluded that access to finance is crucial in dispensing modern agricultural machinery that robustly impacts value-added agriculture productivity. Abu and Issahaku (2017) conducted a similar study in Ghana, focusing on the association between financial inclusion and agricultural commercialisation, which involves transitioning from subsistence agriculture to commercially-oriented production. They uncovered that financial inclusion, such as access to credit and bank and savings accounts, promotes agricultural commercialisation. Financial inclusion allows farmers to store their surplus income, which they can withdraw and reinvest in agriculture during peak planting season, making them more resilient.

Turning to 30 Chinese provinces in China, Hu et al. (2021) focused on agricultural production modernisation. It showed that overall financial inclusion significantly improves agricultural total factor productivity (TFP) growth by transforming the traditional self-sufficient operation into an export-oriented operation that is highly specialised, primarily due to higher financial service usage.

As agriculture is a precarious business, scholars demonstrate a heightened interest in insurance as a risk management tool that promotes agricultural development and creates a financially sound agricultural value chain. Using data from 1998 to 2000, Orden (2001) disclosed that crop insurance as a risk mitigation instrument significantly improves agricultural production output. Based on Mexican data, Valdés et al. (1986) observed the potential of crop insurance to increase farmers' incomes as the efficient mean

income standard-deviation frontier shifted upward. The positive outcome is because crop insurance has social, developmental, and poverty reduction benefits, apart from acting as an income stabiliser for farmers, protecting them against weather risks, and can be used as collateral to facilitate their access to agricultural finance (Dick & Wang, 2010).

Using nationwide cross-sectional data, Just et al. (1999) found that uninsured farmers receive lesser expected benefits than insured farmers when their income level fluctuates due to unmanaged risks. Thus, a complete insurance scheme is required for agricultural sustainability and to prevent farmers from falling into poverty.

Given a strong association between financial inclusion and agricultural sustainability and agricultural sustainability reduces undernourishment, Claessens & Feijen (2007) documented that financial inclusion can reduce the prevalence of undernourishment via higher agricultural productivity. Their study thoroughly analysed the positive effects of financial inclusion on undernourishment through 3 channels, namely productivity, productivity-enhancing inputs, and increased output. However, as they use private credit to GDP as a proxy of financial inclusion, it might not directly capture access to financial services for the undernourished. Hence, this research uses a more comprehensive measure of financial inclusion inclusive of insurance and forms the hypothesis as follows:

H2$_a$: There is no significant relationship between financial inclusion, agricultural sustainability, and undernourishment.

H2$_b$: There is a significant relationship between financial inclusion, agricultural sustainability, and undernourishment.

2.2.5 Financial Inclusion and Well-Being (SDG 3)

The human development concept is developed on the ground that quality of life is measured by many dimensions and not income alone (Sen, 1985). Other socioeconomic measures related to health, education level, and standard of living are equally valuable in human development as it is an unquantifiable concept. Besides, there is a longstanding interest in psychology, medical, and social indicators associated with subjective assessments of life quality or subjective reports about work, health, and community domains. As part of human development, well-being is understood as a multifaceted phenomenon that can be assessed by a range of measurements based on subjective and objective criteria (Forgeard et al., 2011).

According to Demirgüç-Kunt et al. (2017), financial inclusion, economic growth, and human development may have a positive relationship. Klapper et al. (2016) opined that financial inclusion improves health by helping people to manage medical expenses without depleting their savings and moving past a health crisis. According to Zhuang et al. (2009), savings allow households to increase their capacity to absorb external shocks, smooth their consumption,

build wealth, and invest in human capital development like schooling and medical care.

The United Nations developed the human development index (HDI) to measure human development, wellness, and quality of life across multiple dimensions. Churilova et al. (2019) compared the existing HDI with other variables of human well-being in developed countries and found a strong association between the two, indicating that HDI is a strong indicator of well-being. As such, existing literature explores the connection between financial inclusion and human well-being by using the human development index (HDI) for its ability to capture different aspects of human well-being. Raza et al. (2019) used HDI and three representative indicators to measure social and economic development and found a significant connection between financial inclusion and human development in Pakistan.

A more comprehensive analysis was carried out by Matekenya et al. (2020) to examine the welfare-enhancing effect of financial inclusion in Sub-Saharan African countries using a generalised method of moments (GMM) method. Their study on the impact of financial inclusion on different indicators of HDI, including life expectancy, income, and education attainment, supported the view that wider accessibility and usability of financial services foster human development and improve health outcomes by enabling households to reimburse health expenditure.

Understanding that the presence of access points does not equate to using these facilities, Datta and Singh (2019) conducted a cross-country analysis by computing a multidimensional FI index for developed and developing countries. They observed a positive correlation between the FI index and HDI. Their findings justified that people's awareness and motive to use financial facilities for their ends increase with income, education, and health conditions. Notwithstanding, Unnikrishnan and Jagannathan (2015) revealed in their study that income as a predictive factor of financial inclusion holds genuine only in low-income countries. In contrast, changes in financial inclusion affect overall human development at all levels. Their finding suggested that a high income as proxied by GDP is insufficient for balanced growth in an economy as critically as the distribution of wealth and human development. Cahill (2002) found that higher HDI levels are associated with growing GDP only at a diminishing rate.

As individuals are risk-averse, the effects of various risks on people's well-being are widely studied, such as inflation risk (Wolfers, 2003), unemployment risk (Lelkes, 2006), and fluctuation risk (Graham, 2009). In this regard, insurance is expected to improve people's health and well-being by mitigating these risks. Keng and Wu (2014) studied the effect of health insurance on the elderly well-being in Taiwan before and after introducing a complete health insurance system. They discovered that health insurance promoted elderly well-being by raising healthcare standards, minimising financial loss due to health issues, and closing healthcare disparities. Tella et al. (2003) believed that insurance would enhance people's well-being by giving

them unemployment benefits. Vega, Rodriguez, and Gruskin (2009) assessed the perceived quality of healthcare distribution among a Latino sample group and the role of insurance in different patient subgroups. Overall, the insured are more satisfied with their care than those uninsured.

Nguyen, Rajkotia, and Wang (2011) reported that insured people in Ghana paid much less than the uninsured for the same quality of healthcare service. Meanwhile, Veenhoven (2000) found no significant relationship between social insurance and people's well-being, indicating that insurance does not necessarily affect well-being. Given that the importance of insurance in financial inclusion to foster health and well-being is established by most studies, the following hypothesis is developed:

H3$_a$: There is no significant relationship between financial inclusion, health, and well-being.

H3$_b$: There is a significant relationship between financial inclusion, health, and well-being.

2.2.6 Financial Inclusion and Gender Equality (SDG 5)

Access to finance contributes largely toward a woman's well-being and empowerment (Narain, 2009). Staveren (2001) posited that gender biases in the financial market are the culprit that reinvigorates the existing inequality between men and women and further accentuates poverty among women. Many studies have measured financial inclusion using secondary data to identify the

effects of financial inclusion on gender equality. In their study on sub-Saharan Africa, Ohiomu and Ogbeide-Osaretin (2019) showed that financial inclusion substantially reduces gender inequality. Notably, financial access tends to minimise gender inequality more than its usage, as women in Africa have long been accustomed to going to the bank than using technology tools to access financial services. Access to finance empowers women as it affects a woman's ability to make decisions, boost their self-confidence, and improve their community status (Cheston & Kuhn, 2002).

In the international context, most studies used secondary data to determine the extent of financial inclusion. Studies employing primary data on women's financial behaviour and decision-making influence on gender equality are scarce. For this reason, Bhatia and Singh (2019) developed a structured questionnaire on the multi-dimensions of female empowerment and financial inclusion in rural India. The study revealed that inclusive financial programs by the government could lead to higher social, political, and economic empowerment. Furthermore, the sustainability of these financial schemes depends on the government's involvement in generating economic activities for women. Another regional-level study was conducted by Kulkarni and Ghosh (2021) to investigate the gender gap in access to digital finance in India, using both primary and secondary data. Their analysis based on primary data collected from women in urban and rural areas showed that income and age could influence a woman's decision to use a digital transaction. Smartphone ownership gives women more autonomy and helps them make financial decisions.

On the other hand, insurance also plays a significant role in gender equality. As women are more likely to be poor, insurance can provide effective measures to mitigate risks and manage shocks. Cohen et al. (2005) found that women in East Africa use formal group-based and self-insurance strategies to reduce the impacts of vulnerabilities. Using cross-sectional data, Asad et al.'s (2020) study showed a positive association between microinsurance and women's empowerment as insurance could mitigate vulnerability factors that jeopardise women's enterprises. Additionally, insurance can empower women and positively affect women's labour and asset productivity, improving their living conditions and lifting them from poverty.

However, there is contradictory evidence on financial inclusion and gender equality. Goetz and Gupta (1996) challenged the assumption of credit availability to women leading to economic empowerment by studying the special credit institutions in Bangladesh. They argued that financial inclusion does not significantly impact women's economic empowerment as a big portion of women's financial resources were constrained by their male counterparts. Mayoux (2000) further concluded that empowerment is not the immediate result of micro-finance programs. Khalaf and Saqfalhait (2020) investigated Arab women's economic empowerment factors. Using data from 2008 to 2016 for the Arab countries, micro-finance programs' performance in enhancing women's empowerment was assessed. Their study showed that access to financial services is insufficient to explain women's empowerment.

In their analysis, Zhang and Posso (2017) studied the impacts of microfinance institutions on gender inequality in 64 developing economies by employing two gender inequality measures, namely the Gender-related Development Index (GDI), measuring gender disparities in health, knowledge and living standards and the Gender Inequality Index (GII) whose focus is on reproductive health, empowerment and economic status. The study's findings indicated that financial inclusion decreases gender inequality internationally, but the effects vary across regions due to cultural characteristics, religions, conservatism, and the growth of the Microfinance Institutions (MFIs) industry. Kabeer (2005) also argued that microfinance does not automatically translate into women's empowerment as the underlying country-specific characteristics will also manipulate the finance-gender inequality nexus. For example, in a culture that emphasises female dependency and blocks women's access to new opportunities by limiting their participation in economic activities, financial inclusion does not foster gender equality (Cornwall, 2016). Given the mixed results from empirical studies, this study tests the following hypothesis for the effects of financial inclusion on gender equality:

H4$_a$: There is no significant relationship between financial inclusion and gender equality.

H4$_b$: There is a significant relationship between financial inclusion and gender equality.

2.2.7 Financial Inclusion and Economic Growth (SDG 8)

Contemporary finance researchers' understanding of the causality between financial inclusion and growth has been on a progressive evolution (Puatwoe & Piabuo, 2017). Levine's (2005) study presented an in-depth inspection of how the financial sector plays a leading role in economic growth. Four key features of a well-developed financial system are risk management, mobilisation of savings, reduction of transaction and information costs, and specialisation of production. Together, these features favour growth through additional efficiency in resource allocation and human capital accumulation, accompanied by accelerating technological progress (Goyal et al., 2006). Fabya (2011) added that the financial sector provides borrowers with diverse low-risk and high-return financial tools to boost economic growth.

A changing financial landscape has led to renewed interest in the existing finance–growth nexus. Specifically, Naceur and Ghazounai (2007) examined the association between financial development and economic growth among the countries of the Middle East and North Africa (MENA) region. Their studies present an early work in the finance-growth nexus where financial deepening through the banking system is presumed to be all-inclusive. Their results showed that banking development is a detriment to growth. Segregation between financial deepening and financial inclusion is drawn in later studies, as simply having the infrastructure does not guarantee its accessibility and usage. Other studies included a financial access index (Honohan, 2008; Rojas-Suarez, 2010), a multidimensional index (Van et al., 2019; Cámara & Tuesta, 2014), or

a composite index (Demirgüç-Kunt & Klapper, 2012) to study the finance-growth nexus.

In Van et al.'s (2019) analysis, they computed an FI index to interpret the impact of financial inclusion on economic growth by combining the approaches of Sarma (2008) and Park and Mercado (2015). However, unlike the previous studies, they averaged their time-series data into a three-year set to address missing data issues. Their findings supported the positive relationship between financial inclusion and economic growth in 152 countries. The positive impact is more substantial in low-income countries with low financial inclusion levels, affirming that implementing financial inclusion strategies as a stimulant for economic growth is wise.

With access to formal financial services, the underprivileged and vulnerable groups have equal opportunities to get an education and increase their assets, thus resulting in reduced income inequality and greater economic growth (Mehrotra & Yetman, 2015). Kim et al. (2016) presented a positive impact of financial inclusion on economic growth through the diffusion of Islamic finance in the Organisation of Islamic Cooperation (OIC) countries using a dynamic panel regression method. Martinez (2011) argued that financial inclusion as an impetus for economic growth must be considered by policymakers worldwide. They expanded affordable and reliable financial services for all economic agents, resulting in exponential growth and the respective output. Emara and Said (2021) ferreted the causality between financial inclusion and growth in the MENA region using a GMM technique.

They discovered that financial inclusion proxied by the households' financial access index positively influenced economic growth in the MENA region. They further revealed the importance of financial supervision and regulation complemented by institutional quality in reinforcing the finance-growth nexus's potential links.

On the contrary, other studies postulated a negative association between financial inclusion and economic growth. For instance, Naceur and Ghazounai (2007) studied the finance-growth nexus in 11 Middle East and North African (MENA) countries and revealed that greater access to banks negatively influences economic growth. Khan's (2001) study also showed a negative relationship between financial inclusion and economic growth. Banking institutions attempted to reach the poor by lowering their loan standards with shorter loan terms. However, such an attempt in several countries backfired due to the increased risk facing banking institutions (Durner & Shetret, 2015).

Like other financial services such as credit and stocks, insurance is critical for sustainable economic growth. Ward and Zurbruegg (2000) were some of the first to explore the impact of insurance on economic growth in OECD countries using the total insurance premium as their proxy. The results revealed that the relationship is significant in some OECD countries while the opposite is true for others. Using disaggregated data, Kugler and Ofoghi (2005) found a positive association between insurance and economic growth. They documented the difference using aggregate data (life- and non-life insurance premiums). Arena (2008) also found different results at both aggregate and

disaggregate levels. The contradictory findings suggested that the proxy choice could substantially affect the outcome. An early work by Outreville (2013) emphasised that property-liability insurance and life insurance are the keys to growth. Din et al. (2017) noted that the insurance industry helps develop the financial sector by increasing its competitiveness and efficiency and promoting economic growth. To meet the scholarly demand raised by previous studies, the effect of insurance in various dimensions of financial inclusion on economic growth is worth examining. Thus, the below hypothesis is devised:

H5$_a$: There is no significant relationship between financial inclusion and economic growth.

H5$_b$: There is a significant relationship between financial inclusion and economic growth.

2.2.8 Financial Inclusion and Industry, Innovation, and Infrastructure (SDG 9)

The linkage between financial inclusion and innovation is widely acknowledged in previous studies. However, determining the direction between financial inclusion and innovation can be difficult as both factors mutually influence each other over time. On the one hand, financial inclusion positively affects innovation as better access to financial services enables financially constrained firms to access more financial resources necessary to drive innovation in technology progress, organisational design, and business models (Shi et al., 2019). According to Bhatt and Mundial (1989), financial inclusion results in

innovation in the financial system that reduces risk and transaction costs and facilitates an efficient payment system and institutional efficiency.

Alternatively, financial inclusion has received closer attention from empirical studies as a propeller for financial innovation and infrastructure (Allard & Williams, 2020; Otekunrin et al., 2021). Demirgüç-Kunt et al. (2018) documented that governments that adopt digital payments rather than cash can increase account holdings and reduce corruption, creating a climate that upholds infrastructure and innovation for entrepreneurship. In identifying the determinants of national innovative capacity in Africa, Allard and Williams (2020) unveiled that trade openness and financial inclusion have a pivotal role in growth and innovation. The effects of financial inclusion on innovation are stronger in higher-income countries by spending more on companies' R&D and university-industry collaboration. On a similar note, Otekunrin et al. (2021) used panel structural vector autoregression and found that financial inclusion can positively contribute to innovation in the long- and short-run through the African economy feedback hypothesis. Hence, a contractionary monetary policy might adversely affect innovation and lead the economy to unfavourable outcomes by halting financial inclusion development (Chu & Ratti, 1997).

More evidence is revealed in Qamruzzaman and Wei's (2019) study investigating the asymmetric linkage between financial inclusion, innovation, development, and remittance inflows in African countries using the Granger-Causality test. They exhibited a bidirectional casualty between financial inclusion and innovation, suggesting that financial sector development vitalises

innovation in the financial system and *vice-versa*. Contrarily, Lashitew et al. (2019) claimed that demand-related factors of financial inclusion have an obvious effect on mobile money adoption in Kenya. The greater adoption of mobile money innovations is driven by a supportive regulatory environment than a latent demand for financial access alone. The Kenyan experience indicates that the ultimate goal of financial inclusion would not be attainable without a regulatory climate that reduced market uncertainties.

Insurance also drives industry, innovation, and infrastructure in many aspects. For instance, Lee et al. (2019), who studied the effect of financial services on globalisation in Belt and Road countries, argued that the insurance market could provide insurance coverage, risk management solutions, and other financing services for countries in the Belt and Road initiative. They further clarified the different roles between life and non-life insurance in supporting industry and infrastructure development. Utilising data from Chinese public firms over the 2007–2016 period, Wang (2019) found that insurance positively impacted firm innovation by enhancing the firm's risk-bearing capacity. Firms with greater risk tolerance and appetite are more inclined to accept new knowledge, skills, and techniques conducive to firm innovation.

Another study by Wang et al. (2017) identified the importance of insurance in reducing innovative risks. They further recommended that the government offer insurance subsidies to help firms adopt sustainable innovation and cleaner production. Zhang and Nie (2021) found that insurance incentivises pharmaceutical innovation and medical technologies in the healthcare industry.

While studies incorporating insurance showed positive effects on the industry, innovation, and infrastructure, studies on financial inclusion have missed out on industry and infrastructure. To test whether financial inclusion supports industry, innovation, and infrastructure, this study forms the following hypothesis:

H6$_a$: There is no significant relationship between financial inclusion, industry, innovation, and infrastructure

H6$_b$: There is a significant relationship between financial inclusion, industry, innovation, and infrastructure

2.2.9 Financial Inclusion and Inequality (SDG 10)

With rising inequality becoming a widespread concern, how finance affects wealth and income distribution has become controversial (García-Herrero & Turégano, 2015; Omar & Inaba, 2020). Although some pointed to a positive association between financial inclusion and inequality, most showed the opposite results. Results by Dabla-Norris et al. (2015) and De Haan and Sturm (2017) showed that financial development could dampen the equality of society. Park and Mercado (2018) found that the degree of access to finance reduces income inequality depending on geographical characteristics.

In contrast to these studies, García-Herrero and Turégano (2015) empirically examined whether financial inclusion reduces inequality in income distribution when controlling for key macroeconomic factors like economic growth and fiscal policy using Pooled Ordinary Least Square (POLS). Their

regressions validated the Kuznets curve hypothesis, where the inequality-reducing power of financial inclusion relies on a country's developmental level. While a significant positive relationship between financial inclusion and income equality is present, such a relationship fades when income equality is measured against the financial sector's size. Hence, distinguishing between financial inclusion and financial development is critical in policies to combat inequality.

A similar result was reported by Salazar-Cantú et al. (2015), where financial inclusion initially results in greater income inequality but reduces income inequality later in Mexico. Omar and Inaba (2020) constructed an FI index using indicators that reflected the depth of outreach of financial services and disclosed a negative relationship between financial inclusion and inequality. The inequality-mitigating effects of financial inclusion are strengthened when its interaction with GDP growth and the rule of law is considered. Higher growth increases employment opportunities and earnings, while institutional quality mitigates additional costs to the formal financial system.

Fintel and Orthofer (2020) analysed financial inclusion's effect on wealth and income inequality in Africa by dividing their sample period into two datasets. Their study was the first to differentiate income inequality from wealth inequality in the African context, where income and wealth inequality are often viewed as substitutes for each other. Their findings confirmed that financial inclusion significantly reduces income inequality but has no impact on wealth inequality. Thus, they recommended that financial institutions extend their services to the poor. Fouejieu et al. (2020) also found a negative association

between financial inclusion and income inequality measured by the GINI index. Meanwhile, contractionary monetary policy in the form of higher interest rates and gender gaps disproportionately diminishes the benefits of financial inclusion by affecting labour income and employment (Carpenter & Rodgers III, 2004).

Insurance profoundly affects wealth distribution, asset prices, and smoothing consumption (Mengus & Pancrazi, 2021). From public and private money theory, insurance is critical in reducing inequality. Public insurance has two entangled effects on society: it redistributes wealth and income and cushions people against random catastrophes (Esarey et al., 2012). Private insurance, though its intention is not to address social inequality per se, its relevance in redistributing wealth among the population is apparent. When an unexpected disaster like the death or disability of the main provider of a household occurs, people do not immediately lose income to maintain their living standards. .

Kaestner and Lubotsky (2016) reviewed the literature that illustrates the relationship between insurance and inequality in the US. They showed that introducing Medicare and Medicaid in the US tends to flatten income distribution. However, the findings of Moene and Wallerstein (2001) did not produce solid evidence of how insurance hedges against the risk of income loss that vary across individuals at different income levels. Given these arguments, this study is inclined to the view that insurance in financial inclusion lowers inequality. Hence, the following hypothesis is tested:

H7ₐ: There is no significant relationship between financial inclusion and inequality.

H7ᵦ: There is a significant relationship between financial inclusion and inequality.

2.2.10 Financial Inclusion and Sustainable Development (SDG Index)

Sustainable development goals account for economic efficiency, social responsibility, and environmental protection. These three elements combined are called the pillars of sustainable development merged in an integrated framework. Plenty of studies set a significant relationship between financial inclusion and different aspects of sustainable development. Practical inferences can indeed be drawn from their findings, but banking-related and microfinancing data alone is insufficient to provide comprehensive insight into how insurance is integrated into the financial system and help achieve multifaceted sustainable development. The use of insurance data is crucial to shed light on how excluded individuals and households with fewer coping strategies benefit from financial inclusion by building up their resilience against unpredicted shocks and providing them with a safety net to prevent them from falling into poverty (Churchill & Marisetty, 2020). A study that illustrates the relationship between financial inclusion and 7 finance-related SDGs is missing out.

Hence, this study first computes an FI index integrating life- and non-life insurance data. This study further contributes to these related bodies of

literature by examining the impact of financial inclusion on sustainable development with a broad set of variables at the cross-country level.

H8$_a$: There is no significant relationship between financial inclusion and sustainable development

H8$_b$: There is a significant relationship between financial inclusion and sustainable development

2.3 Summary

The main highlights of Chapter 2 are summarised in Table 2.1 and Table 2.2.

Table 2.1 Summary of Research Objective 1

Gap in Knowledge	Reference	Methods
Computation of an insurance-adjusted Financial Inclusion Index (FI index) using a Euclidean Distance Method (Objective 1)		
Few studies have included insurance as part of their FI index and are only limited to banking services. The limited studies that include insurance in their FI index made no distinction between life and non-life insurance.	Sarma (2008)	Euclidean Distance Method (Non-parametric)

Source: Author's own summarization

Table 2.2 Summary of Research Objective 2

Gap in Knowledge	Theories	Hypotheses
The relationship between the insurance-adjusted Financial Inclusion index (FI Index) and 7 finance-related Sustainable Development Goals (SDGs) at the cross-country level (Objective 2)		
Studies about the relationship between financial inclusion and poverty reduction at the cross-country level have not included the role of life and non-life insurance as part of their FI index.	Institutional Theory	$H1_a$: There is no significant relationship between financial inclusion and poverty reduction. $H1_b$: There is a significant relationship between financial inclusion and poverty reduction.
There are relatively few studies about the relationship between financial inclusion, agricultural sustainability, and undernourishment that have distinguished between life and non-life insurance. The measurements for agricultural sustainability are inconsistent.	Solow Economic Growth Theory	$H2_a$: There is no significant relationship between financial inclusion, agricultural sustainability, and undernourishment. $H2_b$: There is a significant relationship between financial inclusion, agricultural sustainability, and undernourishment.
Past studies on the relationship between financial inclusion, health, and well-being did not consider insurance in their FI index. HDI is critiqued for its limitations as a comprehensive measure of population well-being as there are many other dimensions it	Public Good Theory Capability Theory	$H3_a$: There is no significant relationship between financial inclusion, health, and well-being. $H3_b$: There is a significant relationship between financial inclusion, health, and well-being.

ignores (Ranis et al., 2006).		
Previous studies have not included financial inclusion as part of their FI index. Mixed results are produced for gender equality based on different demographic characteristics and measurements used.	Vulnerable Group Theory Integrationist Approach	$H4_a$: There is no significant relationship between financial inclusion and gender equality. $H4_b$: There is a significant relationship between financial inclusion and gender equality.
Mixed results are produced for economic growth based on different geographical areas, and indicators of the FI index are used. Previous studies focus merely on GDP and neglect other factors like interest rates and inflation.	Modern Development Theory	$H5_a$: There is no significant relationship between financial inclusion and economic growth. $H5_b$: There is a significant relationship between financial inclusion and economic growth.
Current studies focus on the direction from innovation to financial inclusion compared to financial inclusion to innovation. Previous studies have focused more on innovation, ignoring infrastructure and industry development as integral to sustainable development.	Special Agent Theory Life-Cycle Theory	$H6_a$: There is no significant relationship between financial inclusion, industry, innovation, and infrastructure. $H6_b$: There is a significant relationship between financial inclusion, industry, innovation, and infrastructure.
Contradictory findings are established by studies using different measurements for inequality. Insurance is a missing variable linking	Public Money Theory Private Money Theory	$H7_a$: There is no significant relationship between financial inclusion and inequality. $H7_b$: There is a significant relationship between financial inclusion and inequality.

financial inclusion and inequality.		
A study that covered 7 of the 17 SDGs that are finance-driven as outlined by the World Bank is missing out.	-	$H8_a$: There is no significant relationship between financial inclusion and sustainable development.
There is a lack of a readily available index that captures the 7 mentioned goals.		$H8_b$: There is a significant relationship between financial inclusion and sustainable development.

Source: Author's own summarization

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter first outlines the methods employed to compute the insurance-adjusted FI index (Objective 1). Section 3.2 discusses how the Sustainable Development Goal (SDG) index for 7 finance-driven SDGs is developed. Section 3.3 describes the data used in this study. The next section specifies the multivariate panel regression models (Objective 2), including pooled Ordinary Least Square (POLS), Random Effect Model (REM), and Fixed Effect Model (FEM), to examine the relationship between financial inclusion and sustainable development. The model used in performing robustness checks is also discussed in Section 3.4. The last section concludes the study.

3.1 Computation of Financial Inclusion Index (FI index)

Drawing from the existing literature, the methods to compute an FI index can be classified as parametric and non-parametric. Sarma (2008) first introduced the parametric method using normalised inverse Euclidean distance. Despite its instrumentality in computing an FI index, it receives criticism because its weight assignment relies mainly on researchers' intuition, potentially resulting in an arbitrary element in the FI index. Other studies addressed this methodological issue using a parametric method, namely PCA and FA,

introduced by Cámara and Tuesta (2014) and Amidžić et al. (2014), respectively. PCA is a dimensionality reduction method that retains trends and patterns in financial inclusion data in weight assignment. A drawback of PCA is that it is sensitive to the scale of the features. Given the nature of the data is widely spread in its values, PCA can produce biased results.

FA is used to understand how different underlying factors influence the variance among the variables. A drawback of the FA method is that it reduces a set of variables to a smaller number of factors; hence, not all the available data is utilised for each country.

After a thorough evaluation of the pros and cons of each method, this study uses the approach of Sarma (2008) to compute a multidimensional FI index that incorporates three dimensions: availability, accessibility, and usage of financial services with an equal weight assignment to avoid the methodological drawback of Euclidean distance method. This method is similar to the United Nations Development Programme (UNDP) method to compute multidimensional indices to compute the well-known Human Development Index (HDI).

To compute the FI index in this research, the initial dimension index d_i is calculated for each dimension of financial inclusion. The dimension indexes measure a country's achievement in the respective dimension. For those dimensions, which include more than one indicator, each indicator is normalised using Equation (1), and the dimension index is computed as a simple weighted

average, where equal weights are given to each indicator. In n-dimensional Cartesian space, the economy i will be represented by a point $d_i = (d_1, d_2, d_3, …, d_n)$; a higher value of the dimension index indicates greater achievement a particular dimension. High financial inclusion would imply a large distance from the worst point and a small distance from the ideal point. The FI index is measured by averaging two distances between the worst and the achievement point and the inverse distance between the ideal and the achievement point.

The following equation will first compute a dimension index for each of these dimensions:

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i} \tag{1}$$

where A_i= Actual value of dimension i, m_i= Minimum value of dimension i, M_i= Maximum value of dimension I, and w_i= weight attached to dimension i

After the computation of three dimensions - availability, accessibility, and usage, with the same weights assigned for each dimension, the FI index for all countries is computed following Equation (2).

$$FII = 1 - \sqrt[2]{\frac{(1-d_1)^2 + (1-d_2)^2 + (1-d_3)^2}{n}} \tag{2}$$

The normalisation is carried out to ensure the value is between 0 and 1. An inverse distance makes a higher value of the FI index corresponds to higher financial inclusion.

The sub-indicators for availability, accessibility, and usage dimensions are categorised into banking-related and insurance-related. The first is

availability. An inclusive financial system should encompass all segments of society. In other words, its availability must be comprehensive, and everyone is permitted access to finance except those who voluntarily deny their opportunities. To capture whether the financial services are obtainable, this study uses (i) Number of deposit accounts with commercial banks per 1,000 adults, (ii) Number of loan accounts with commercial banks per 1,000 adults, (iii) Number of credit cards per 1,000 adults, (iv) Life insurance density (Ratio of life insurance premium to population), and (v) Non-life insurance density (Ratio of non-life insurance premium to population).

The second is accessibility. According to Sarma (2016), bank transaction points in an inclusive financial system such as offices, branches, and ATMs must be readily available to users. To ensure universal access to formal financial services, this study includes (i) Number of ATMs per 100,000 adults and (ii) Number of conventional insurance corporations per 100,000 adults. The third is usage. Kempson et al. (2004) found a paradox in some countries where financial services are not utilised despite a large portion of the population owning a bank account. Therefore, merely having accounts and branches does not guarantee inclusiveness. The consumption of financial services includes: (i) Outstanding loans from commercial banks (% of GDP), (ii) Outstanding deposits with commercial banks (% of GDP), (iii) Total life insurance premium (% of GDP), and (iv) Total non-life insurance premium (% of GDP).

After computing the FI index for each country using banking indicators, banking and life insurance indicators, banking and non-life insurance indicators,

and banking, life, and non-life insurance indicators, an additional calculation of the absolute difference between each FI index will be carried out. This step allows us to capture the magnitude of the variation when different genres of insurance come into the picture.

3.2 Finance-Related Sustainable Development Goal (SDG) Index

Sustainable development is much more complex to measure than other more straightforward concepts in economics as its focus spans from the environment and social to economics. The most commonly used measurement is the SDG index, a synthetic measure that encapsulates every aspect of sustainable development. Meanwhile, some studies use indicators that capture only certain aspects of sustainable development, such as poverty and inequality, as indicated in previous studies. Both measurements have drawbacks and are unsuitable for this study as the former is too broad, whereas the latter is too narrow. Hence, it computes an SDG index - a better fit as it covers the 7 goals identified by previous studies as potentially driven by financial inclusion. As demonstrated by the United Nations, calculating the SDG index comprises two steps: rescale the data using normalisation to ensure comparability across indicators and then aggregate the indicators to compute the respective SDG.

To ensure that the data from each indicator is comparable, all the variables are transformed linearly between 0 to 100, where 0 denotes the worst possible performance and 100 indicates the ideal performance using the formula as follows:

$$Y^{'} = \frac{y - \min(y)}{\max(y) - \min(y)} \text{ x}100 \tag{3}$$

where y is the raw data value; max represents the upper boundary whereas min denotes the lower boundary, respectively; and $Y^{'}$ is value rescaled using normalisation. After rescaling, the variables are all expressed in ascending order, from the optimal performance to the worst. Hereby, the rescaled data become easy to interpret and compare with other indicators. For instance, a country with a score of 50 on a variable is halfway reaching the optimal value; a country that scores 75 is only a quarter away from the optimal value.

As an academic consensus on whether greater weights should be assigned to one SDG over another has not been achieved, this study gives equal weight to each SDG, mirroring the commitment of governments to treat all SDGs equally as an equally important and non-exclusive set of goals. In other words, countries need to focus on all goals instead of focusing on one and ignoring the rest to improve their overall SDG index score. After getting the scores for each indicator, the arithmetic mean is calculated for indicators for the 7 goals covered in this study. These scores are then averaged across all 7 SDGs to obtain the overall score for the SDG index. A similarly combined index was computed by Nigam and Pant (2020) by excluding 3 SDGs that are unrelated to their research objectives. The difference with their combined index is that they used the weightage method in computing their SDG index, whereas the arithmetic method is used in this study.

3.3 Data Description

For research objective 1, a longer sample period (2015 – 2019) is selected to illustrate the five years trend of the FI index. For research objective 2, this study employs cross-country estimations and utilises macroeconomic data from 78 member countries in Worldbank from 2017 to 2019 given the publication of SDGs data by the United Nations is available only from 2017 up till the latest data available, which is 2019. The sample countries (78 countries) are selected from the member countries in Worldbank which have a full set of data for the study period. Using a large sample size to develop a consistent and robust financial inclusion would help to standardise the measurement for all countries in the sample.

The dependent variables of this study are the Sustainable Development Goal (SDG) index computed using indicators for 7 goals and each of its goals outlined by the United Nations. The indicators used to compute the SDG index were extracted from Sustainable Development Reports (https://www.sdgindex.org). This report is the first global assessment of countries' progress toward achieving Sustainable Development Goals.

For the FI index computation, the study uses data on all three dimensions (availability, access, and usage) for 78 countries from 2015 to 2019. The year 2015 is when the SDGs were introduced, whereas the year 2019 is when the latest data is available. While this study follows Sarma's (2008) approach to computing a multidimensional FI index, it uses insurance-related indicators for

each dimension of the FI index. The FI index is computed based on three dimensions: availability, accessibility, and usage of financial services. The dataset is obtained from the Financial Access Survey (FAS) of the International Monetary Fund (IMF) and the Global Findex database of the World Bank. The source of data is presented in Table 3.1.

Table 3.1 Source of data for FI index

Dimension	Indicators	Abbreviations	Source
Availability	(i) Number of deposit accounts with commercial banks per 1,000 adults	*deposit.acc*	Financial Assess Survey Database from International Monetary Fund
	(ii) Number of loan accounts with commercial banks per 1,000 adults	*loan.acc*	
	(iii) Number of credit cards per 1,000 adults	*c.cards*	
	(vi) Life insurance density	*life.density*	Global Findex Database from World Bank
	(vii) Non-life insurance density	*n.life.density*	
Accessibility	(i) Number of ATMs per 100,000 adults	*ATM*	Financial Assess Survey Database from International Monetary Fund
	(ii) Number of conventional insurance corporations per 100,000 adults	*ins.corp*	Global Findex Database from World Bank
Usage	(i) Outstanding loans from commercial banks (% of GDP)	*loan*	Financial Assess Survey Database from International Monetary Fund
	(ii) Outstanding deposits with commercial banks (% of GDP)	*deposit*	

(iii) Total life insurance premium (% of GDP)	*life.spending*	Global Findex Database from World Bank
(iv) Total non-life insurance premium (% of GDP)	*n.life.spending*	

This study also relies on the existing literature to select macroeconomic variables in the panel regression to control the factors that possibly affect sustainable development. Following Bjork (1999) and Mankiw (2016), this study selected four control variables which are inflation rate (INF), interest rate (INT), population growth rate (POP), and trade openness (TRADE). A recent study by Kim et al. (2016) used these control variables to examine the linkage between financial inclusion and sustainable development in Organisation of Islamic Cooperation (OIC) countries. Their results suggested a statistically significant relationship between these macroeconomic factors and sustainable development symbolised by a positive or negative sign.

The inflation rate (INF) is present in equations (4), (6), and (7), given its association with sustainable development (Ratnawati, 2020; Naceur & Ghazouani, 2007; Kim et al., 2016) because it can widely affect economic and financial activities by either eroding or encouraging the purchasing power of the poor. Besides, significant and unpredictable changes in consumer prices are expected to impose a disproportionate impact on the poor because their assets are stored in the form of cash and they have limited instruments to hedge against inflation (Easterly and Fischer, 2001; Holden and Prokopenko, 2001). Consistently, the coefficient of INF is expected to be negative in the model. The variable INF is computed by the consumer price index (2010 = 100), reflecting

the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals yearly. The data is obtained from the World Bank.

The population growth (POP) is included in equations (4), (6), and (7). The inclusion of POP in the models can be justified by Fouejieu et al. (2020) and Park and Mercado (2015), where demographic characteristics play a crucial role in sustainable development. Economies with rapid population growth often have more access to financial services due to scale economies amplifying their effect. Thus, POP is predicted to be positive in the model. Annual POP for year t is the exponential growth rate of the midyear population from year t-1 to t, expressed as a percentage. The data is collected from the World Bank.

To measure trade openness (TRADE), this study uses the sum of exports and imports of goods and services relative to nominal GDP. The impact of trade openness on poverty conditions is ambivalent. Specifically, Dollar and Kraay (2004) observed that economic openness measured in terms of trade integration alleviates poverty in a large sample of countries. However, other researchers found a contradictory association between trade openness and poverty reduction (Wade, 2004; Milanovic, 2005). As neither theoretical nor empirical studies can provide a conclusive result, this study refrains from predicting the sign of TRADE in equations (4), (6), and (7) at this point of the write-up. The data is extracted from World Bank.

As an instrument of monetary policy, the interest rate (INT) is one of the key determinants of sustainable development (Lagoarde-Segot, 2020; Fouejieu et al., 2020). This is because when a high-interest rate increases the cost of borrowing and savings, fewer financial resources are used as investments to support sustainable growth. Therefore, this study includes INF as a control variable in equations (4), (6), and (7). A real INF is the lending interest rate adjusted for inflation as measured by the GDP deflator using the formula (i - P)/(1 + P). The data is sourced from the World Bank.

3.4 Model Specification

This study uses panel regression models in a static framework and relies on three methods in its estimation. Firstly, pooled ordinary least square (POLS) regression model presents results without regarding the panel structure of the data. The second model is the random effect model (REM), which treats the constants from the sample as random parameters. Then, the fixed effects model (FEM) is used as the third model, where the constant is treated as group-specific and different countries can have different constants.

3.4.1 Pooled Ordinary Least Square (OLS)

Firstly, POLS estimates the results based on the poolability of the data. As Aust et al. (2020) recommended, the model takes each of the 7 SDGs and its overall index as the proxies for sustainable development. To investigate how financial

inclusion contributes to the achievement of SDG on an international level, the following model is specified:

$$SDG_{it} = \beta_0 + \beta_1 FII_{it} + \beta_2 X_{it} + \varepsilon_{it} \tag{4}$$

where the depenent variable, SDG_{it} represents the respective 7 SDGs and the overall index which will enter the equation separately.

The right-hand side of Equation (5) shows the independent variables, including the concerned variable, Financial Inclusion Index (FII_{it}), other control variables (X_{it}), and error term (ε_{it}). The subscripts of i and t refer to country and year. As for control variables, the factors that are identified to influence sustainable development are inflation rate (INF), population growth (POP), interest rate (INT), and the measure of trade openness (TRADE) are included. In this study, financial inclusion is expected to be significantly associated with sustainable development as greater access to finance for lower-income groups is conducive to achieving SDGs, as illustrated from the preceding discussions.

3.4.2 Random Effect Model (REM)

The second model of this study is the random effect model (REM), where the constants for each section are random parameters that account for strong autocorrelation that may display between the unobserved and observed variables. A distinct advantage of REM is that it allows time-invariant variables to be included, unlike the fixed-effect model (FEM), in which its time-invariant variables are absorbed by the intercepts. The random effect model assumes that

each country has its intercept while restricting the coefficient to be homogenous. To accommodate such heterogeneity, ε_{it} is decomposed into two composite error terms:

$$\varepsilon_{it} = \delta_i + \mu_{it} \tag{5}$$

By adding the random variable, the model is specified as:

$$SDG_{it} = \beta_0 + \beta_1 FII_{it} + \beta_2 X_{it} + \delta_i + \mu_{it} \tag{6}$$

where the dependent variable (SDG_{it}) represents the respective 7 SDGs and the overall index which will enter the equation separately. The independent variables in this equation, namely FII_{it} and X_{it} are similar to Section 3.4.1, except that the error term is represented by $\delta_i + \mu_{it}$.

3.4.3 Fixed Effect Model (FEM)

To control for specific time-invariant characteristics of the sample countries uncaptured by the control variables in the data, this study employs the fixed effect model (FEM) as the third model. The constant is treated as group-specific and allows different constants for each country. The model is expressed as:

$$SDG_{it} = \gamma_0 + \beta_1 FII_{it} + \beta_2 X_{it} + \varepsilon_{it} \tag{7}$$

The estimator is similar to the POLS estimator, except that the intercept γ_0 is country-specific. The dependent variable (SDG_{it}) represents the respective 7 SDG and its index which will enter the equation separately, whereas other specifications remain the same as explained in Section 3.4.1.

3.4.4 Model Selection

The selection between POLS and REM is based on the Poolability F-test. In this test, if the null hypothesis is accepted, POLS is preferred, and if the alternative hypothesis is accepted, REM is preferred. In other words, there are country-specific effects in the data. Meanwhile, the Breush Pagan (BP) and Lagrangian Multiplier (LM) tests determine if POLS or FEM is preferred. For the null hypothesis, POLS is preferred; for the alternative hypothesis, FEM is preferred. Finally, the Hausman test is conducted to select the most suitable model between REM and FEM.

3.5 Summary

This chapter discusses the methodologies employed to address research objectives 1 and 2. First, motivated by the lack of an FI index that incorporates the role of life and non-life insurance in financial inclusion, this study computes an insurance-adjusted Financial Inclusion Index (FI index) that encapsulates the effects of life and non-life insurance on financial inclusion. Second, motivated by the changing finance landscape aftermath of the pandemic and the ambiguous theoretical predictions and empirical evidence, this study investigates the relationship between financial inclusion and sustainable development through a cross-country analysis.

For research objective 1, an FI index is computed using the Euclidean distance method (non-parametric), including life and non-life insurance

indicators. For research objective 2, this study also computed its own SDG index following the 7 finance-related SDGs, as indicated by the World Bank. Then, the effects of financial inclusion on sustainable development are estimated using POLS, REM, and FEM under the static panel framework. To ensure the robustness of the empirical analysis, PCA (parametric) is used to compute another set of FI indices and make comparisons. Secondly, the FI index (t) data is replaced with lagged FI index (t-1) data in the estimations.

CHAPTER 4

RESEARCH RESULTS & INTERPRETATION OF RESULTS

4.0 Introduction

This chapter first presents the computation of the FI index for 78 countries from 2015 to 2019 using the Euclidean distance method (Objective 1). Due to the high similarity among the FI indices for 5 years, consolidation of the FI index of all countries across 5 years is done using a simple average to illustrate the changes in FI indices after incorporating life and non-life insurance indicators, followed by a cross-country analysis. A correlation analysis is presented to ensure that the model is free from multicollinearity issues. The major empirical findings (Objective 2) are discussed in section 4.4 by conducting the panel regression analyses using POLS, FE, and RE models. Firstly, the 7 SDGs enter into the regression models separately. Secondly, a finance-related SDG index is computed for 78 countries from 2017 to 2020. Then, only data from the FI index and SDG index from 2017 to 2019 enter the regression models for estimating their relationship. A robustness check is carried out to ensure that the findings are consistent and stable.

4.1 Financial Inclusion Index (FI Index)

The trends of the FI indices for the 78 countries from 2015 to 2019 are presented in Table 4.1 to Table 4.4. Then, the FI indices for the 78 countries are

consolidated and presented in Table 4.5. In Table 4.5, there are Column 1 (banking indicators), Column 2 (banking-and-life-insurance indicators), Column 3 (banking-and-non-life-insurance indicators), and Column 4 (banking-life-and-non-life-insurance indicators). Depending on the value of the FI index, sample countries are segregated into three categories (Sarma, 2008):

1. $0.5 < \text{IFI} \leqslant 1$ – high financial inclusion

2. $0.3 < \text{IFI} \leqslant 0.5$ – medium financial inclusion

3. $0 \leqslant \text{IFI} \leqslant 0.3$ – low financial inclusion

4.1.1 Trends in FI index – Banking (FI_B)

The trend for FI indices using banking indicators from 2015 to 2019 is shown in Table 4.1. Uzbekistan's FI index (149%) has recorded the biggest relative change, followed by China (103%) and Namibia (79%). As the African countries leapfrogged from the low financial inclusion group to the medium financial inclusion group, baking institutions play an essential role in ensuring that more Uzbekistanians and Namibians can use financial services. Meanwhile, financial inclusion in China has become pertinent due to the increasing competitiveness of its banking sector contributed by widening the channels of financial intermediation, enhancing bank supervision and regulation framework, and rapidly developing digital technology (Chen & Yuan, 2021).

Uganda, Cambodia, Pakistan, and Paraguay are the other four countries with a sharp relative increase in their FI indices of more than 50%. Meanwhile, 25 countries have slow growth of less than 50% in their FI indices, implying

that their banking development does not contribute as much to financial inclusion. The rest of the 3 countries' FI indices remain unchanged, while others see a decline over the years. A steep slope in Malawi's FI index indicates that more efforts are necessary to implement an inclusive financial system.

Table 4.1 The trend of the FI index using banking indicators (FI_B) from 2015 to 2019

Country	2015	2016	2017	2018	2019	Relative Change in FI index (%)
Uzbekistan	0.054	0.072	0.114	0.116	0.133	147%
China	0.230	0.227	0.268	0.462	0.466	103%
Namibia	0.190	0.296	0.302	0.294	0.339	79%
Uganda	0.008	0.007	0.016	0.012	0.013	71%
Cambodia	0.114	0.120	0.148	0.164	0.191	68%
Pakistan	0.034	0.034	0.044	0.050	0.051	51%
Paraguay	0.089	0.073	0.116	0.116	0.133	50%
Ecuador	0.086	0.085	0.101	0.083	0.115	34%
Philippines	0.103	0.104	0.123	0.121	0.126	23%
Albania	0.116	0.144	0.152	0.140	0.142	22%
Bolivia	0.092	0.090	0.111	0.111	0.113	22%
Iceland	0.298	0.368	0.391	0.394	0.361	21%
Georgia	0.197	0.192	0.231	0.232	0.228	16%
Egypt	0.115	0.134	0.151	0.143	0.132	15%
Slovak Rep.	0.138	0.137	0.149	0.155	0.154	11%
Costa Rica	0.210	0.201	0.236	0.240	0.227	9%
Indonesia	0.120	0.113	0.137	0.133	0.130	8%
Algeria	0.100	0.088	0.105	0.103	0.106	7%
Honduras	0.137	0.126	0.141	0.144	0.145	6%
El Salvador	0.140	0.125	0.147	0.146	0.147	5%
Trinidad and Tobago	0.178	0.165	0.187	0.181	0.187	5%
Luxembourg	0.564	0.550	0.587	0.602	0.591	5%
Moldova	0.096	0.089	0.104	0.102	0.100	5%
Argentina	0.122	0.115	0.135	0.142	0.127	4%
Serbia	0.159	0.137	0.158	0.168	0.165	3%
Kazakhstan	0.112	0.103	0.105	0.118	0.115	3%
Dominican Rep.	0.090	0.082	0.094	0.090	0.092	2%
Croatia	0.253	0.233	0.245	0.247	0.257	2%
Turkey	0.280	0.277	0.293	0.288	0.284	1%

Jordan	0.193	0.180	0.201	0.200	0.196	1%
Aruba	0.328	0.323	0.340	0.336	0.333	1%
Peru	0.180	0.158	0.168	0.171	0.181	1%
Mexico	0.101	0.101	0.106	0.102	0.101	0%
Colombia	0.165	0.151	0.170	0.167	0.165	0%
Hungary	0.140	0.121	0.141	0.138	0.140	0%
Brazil	0.299	0.257	0.293	0.298	0.295	-1%
Korea	0.536	0.510	0.527	0.523	0.528	-1%
Poland	0.214	0.194	0.215	0.215	0.209	-2%
Chile	0.310	0.275	0.295	0.304	0.302	-3%
North Macedonia	0.218	0.188	0.213	0.212	0.210	-3%
Panama	0.350	0.324	0.342	0.338	0.338	-3%
Thailand	0.278	0.252	0.272	0.273	0.268	-4%
Italy	0.229	0.200	0.225	0.223	0.220	-4%
Romania	0.117	0.099	0.114	0.116	0.112	-5%
Bulgaria	0.238	0.213	0.233	0.232	0.227	-5%
Fiji	0.186	0.183	0.204	0.177	0.176	-5%
Lithuania	0.115	0.110	0.115	0.118	0.108	-6%
Guyana	0.082	0.071	0.079	0.074	0.077	-6%
Slovenia	0.232	0.215	0.221	0.224	0.216	-7%
Singapore	0.405	0.390	0.386	0.388	0.376	-7%
Bahamas	0.388	0.362	0.378	0.367	0.359	-8%
Denmark	0.163	0.149	0.156	0.157	0.150	-8%
Finland	0.196	0.158	0.192	0.182	0.181	-8%
Kenya	0.100	0.088	0.100	0.102	0.092	-8%
South Africa	0.219	0.196	0.214	0.201	0.201	-8%
Belgium	0.374	0.329	0.366	0.357	0.341	-9%
Saudi Arabia	0.189	0.179	0.189	0.175	0.173	-9%
Malaysia	0.323	0.284	0.303	0.300	0.293	-9%
Barbados	0.282	0.349	0.272	0.273	0.255	-10%
Norway	0.217	0.206	0.211	0.209	0.195	-10%
Estonia	0.252	0.226	0.241	0.238	0.226	-10%
Austria	0.207	0.186	0.189	0.188	0.185	-10%
Nicaragua	0.088	0.073	0.102	0.081	0.079	-10%
Greece	0.332	0.302	0.323	0.309	0.296	-11%
Portugal	0.420	0.369	0.384	0.383	0.371	-12%
Spain	0.374	0.326	0.350	0.343	0.326	-13%
Guatemala	0.153	0.131	0.147	0.139	0.133	-13%
Mozambique	0.069	0.061	0.064	0.059	0.060	-13%
Netherlands	0.302	0.263	0.281	0.272	0.261	-14%
Sweden	0.306	0.275	0.284	0.272	0.262	-15%
Australia	0.439	0.434	0.328	0.399	0.373	-15%
Latvia	0.186	0.164	0.178	0.164	0.155	-17%
Czech Rep.	0.196	0.185	0.203	0.199	0.161	-18%
Ukraine	0.226	0.197	0.207	0.173	0.178	-21%
Brunei Darussalam	0.267	0.201	0.236	0.210	0.208	-22%
Ireland	0.276	0.252	0.246	0.225	0.207	-25%
Azerbaijan	0.151	0.112	0.108	0.104	0.111	-26%

Malawi	0.022	0.012	0.006	0.002	0.001	-96%

4.1.2 Trends in FI index – Banking & Life insurance (FI_{BL})

Table 4.2 displays the FI indices using banking-and-life-insurance indicators. Uzbekistan records the biggest relative change of 209% over the years, although its FI level remains low. This is followed by Cambodia (129%) and China (101%). Cambodia has made great strides toward financial inclusion owing to the activeness of microfinance banking and expanding health insurance (Retka, 2018). For the record, China's life insurance industry has emerged as the fifth-largest market globally and is expected to claim the triumph of the world's largest market by 2030 by replacing the US. Other 7 countries also see a significant increase of more than 50% in their FI indices, including developed countries like Iceland and more developing countries such as Paraguay, Uganda, Pakistan, Namibia, Albania, and Egypt. The number of countries whose FI index increases by less than 50% are doubled from the FI indices using only banking indicators, indicating that life insurance could be a major contributor to financial inclusion in these countries.

Only 1 country, *i.e.* Thailand documented a consistent FI index, whereas the rest are stagnant or declining. There is a noticeable soar in most countries' FI indices when life insurance is considered.

Table 4.2 The trend of the FI index using banking-and-life-insurance indicators (FI_{BL}) from 2015 to 2019

Country	2015	2016	2017	2018	2019	Relative Change in FI index (%)
Uzbekistan	0.039	0.049	0.085	0.088	0.119	209%
Cambodia	0.083	0.089	0.112	0.127	0.190	129%
China	0.212	0.207	0.245	0.381	0.427	101%
Paraguay	0.064	0.054	0.078	0.085	0.123	91%
Uganda	0.006	0.005	0.012	0.010	0.011	88%
Pakistan	0.030	0.030	0.038	0.041	0.050	69%
Namibia	0.199	0.273	0.284	0.277	0.323	62%
Iceland	0.208	0.294	0.343	0.313	0.327	57%
Albania	0.086	0.108	0.113	0.104	0.134	55%
Egypt	0.085	0.100	0.114	0.108	0.128	50%
Algeria	0.069	0.061	0.073	0.073	0.102	49%
Bolivia	0.074	0.073	0.088	0.089	0.109	48%
Ecuador	0.076	0.076	0.087	0.069	0.108	43%
Georgia	0.154	0.150	0.179	0.180	0.209	36%
Philippines	0.092	0.088	0.106	0.106	0.120	31%
Honduras	0.106	0.099	0.109	0.111	0.138	30%
Jordan	0.149	0.138	0.157	0.158	0.192	29%
Costa Rica	0.164	0.158	0.185	0.189	0.206	26%
Slovak Rep.	0.124	0.111	0.132	0.134	0.154	25%
Serbia	0.121	0.101	0.121	0.128	0.148	23%
Moldova	0.075	0.072	0.083	0.081	0.092	22%
El Salvador	0.115	0.104	0.120	0.117	0.139	20%
Croatia	0.206	0.184	0.204	0.207	0.244	19%
Turkey	0.209	0.185	0.219	0.214	0.244	17%
Nicaragua	0.065	0.056	0.075	0.063	0.076	17%
Indonesia	0.105	0.102	0.120	0.115	0.122	16%
Mozambique	0.051	0.043	0.046	0.043	0.059	16%
North Macedonia	0.168	0.147	0.165	0.165	0.193	15%
Kazakhstan	0.087	0.076	0.082	0.091	0.098	13%
Luxembourg	0.517	0.434	0.543	0.551	0.585	13%
Bulgaria	0.189	0.172	0.186	0.184	0.214	13%
Guyana	0.061	0.050	0.061	0.058	0.069	12%
Saudi Arabia	0.147	0.139	0.147	0.136	0.165	12%
Dominican Rep.	0.074	0.068	0.077	0.073	0.083	12%
Lithuania	0.094	0.084	0.092	0.094	0.105	12%
Fiji	0.151	0.141	0.165	0.150	0.169	12%
Trinidad and Tobago	0.165	0.164	0.176	0.169	0.183	10%
Panama	0.293	0.269	0.285	0.282	0.324	10%

Colombia	0.138	0.129	0.144	0.140	0.151	10%
Romania	0.094	0.078	0.092	0.092	0.102	9%
Aruba	0.315	0.282	0.329	0.318	0.342	9%
Peru	0.158	0.139	0.145	0.149	0.170	8%
Brazil	0.235	0.179	0.229	0.234	0.250	6%
Poland	0.181	0.163	0.179	0.175	0.192	6%
Estonia	0.199	0.179	0.190	0.187	0.209	5%
Brunei Darussalam	0.187	0.167	0.185	0.171	0.197	5%
Hungary	0.126	0.113	0.127	0.123	0.132	5%
Chile	0.269	0.245	0.258	0.263	0.281	4%
Guatemala	0.112	0.088	0.109	0.104	0.117	4%
Argentina	0.105	0.100	0.115	0.120	0.109	3%
Greece	0.265	0.244	0.260	0.249	0.274	3%
Mexico	0.090	0.083	0.095	0.093	0.093	3%
Slovenia	0.190	0.153	0.186	0.187	0.196	3%
Kenya	0.082	0.074	0.083	0.083	0.083	2%
Singapore	0.439	0.341	0.451	0.443	0.446	2%
Malaysia	0.271	0.239	0.255	0.250	0.272	1%
Thailand	0.257	0.240	0.256	0.254	0.258	0%
Czech Rep.	0.163	0.142	0.166	0.162	0.160	-1%
Bahamas	0.360	0.340	0.348	0.338	0.354	-2%
Belgium	0.352	0.316	0.341	0.332	0.341	-3%
Netherlands	0.269	0.237	0.248	0.236	0.259	-4%
Latvia	0.149	0.132	0.143	0.132	0.143	-4%
Spain	0.326	0.296	0.309	0.300	0.310	-5%
Portugal	0.382	0.346	0.363	0.362	0.360	-6%
Korea	0.549	0.482	0.530	0.512	0.516	-6%
Barbados	0.269	0.260	0.239	0.236	0.247	-8%
Norway	0.243	0.208	0.232	0.226	0.222	-9%
Ukraine	0.171	0.137	0.159	0.136	0.152	-11%
Finland	0.202	0.140	0.181	0.170	0.177	-12%
Sweden	0.332	0.268	0.311	0.303	0.285	-14%
Denmark	0.330	0.248	0.341	0.337	0.282	-15%
Italy	0.288	0.257	0.268	0.262	0.245	-15%
Austria	0.220	0.181	0.195	0.191	0.186	-15%
Azerbaijan	0.110	0.073	0.082	0.081	0.092	-17%
Australia	0.436	0.341	0.383	0.363	0.363	-17%
Ireland	0.328	0.262	0.318	0.280	0.249	-24%
South Africa	0.270	0.238	0.261	0.255	0.198	-27%
Malawi	0.021	0.012	0.010	0.007	0.001	-96%

Source: Author's own computation

4.1.3 Trends in FI index – Banking & Non-life insurance (FI_{BNL})

For FI indices using banking-and-non-life-insurance indicators shown in Table 4.3, the relative change displayed by countries is similar to that using banking and life insurance indicators but slightly lower. Overall, 33 countries see an increment in their FI indices, while the rest record negative changes. Despite growing at a smaller magnitude, the number of countries with increased FI indices is more than those using only banking indicators. Besides, the FI indices are generally higher than those using only banking insurance indicators. The result hints that non-life insurance is critical for financial inclusion, but a noticeable slowdown has been seen in non-life insurance growth in recent years since 2017 (Rudden, 2022). More attention is necessary to the slowing growth of the non-life insurance industry to ensure its capacity to promote inclusive insurance is not undermined over time.

Table 4.3 The trend of the FI index using banking-and-non-life-insurance indicators (FI_{BNL}) from 2015 to 2019

Country	2015	2016	2017	2018	2019	Relative Change in FI index (%)
Uzbekistan	0.040	0.055	0.087	0.084	0.107	169%
China	0.217	0.214	0.244	0.352	0.401	85%
Cambodia	0.083	0.089	0.111	0.124	0.151	81%
Pakistan	0.024	0.025	0.032	0.035	0.037	51%
Namibia	0.188	0.265	0.266	0.250	0.281	50%
Paraguay	0.083	0.077	0.097	0.096	0.119	43%
Uganda	0.011	0.008	0.014	0.010	0.014	28%
Philippines	0.085	0.095	0.100	0.090	0.103	22%
Albania	0.102	0.125	0.130	0.115	0.122	20%
Georgia	0.162	0.159	0.188	0.176	0.190	17%
Egypt	0.085	0.098	0.114	0.105	0.099	16%

Bolivia	0.086	0.083	0.097	0.094	0.098	14%
Slovak Rep.	0.140	0.140	0.150	0.155	0.159	13%
Costa Rica	0.198	0.195	0.224	0.209	0.218	10%
Ecuador	0.116	0.103	0.114	0.089	0.126	9%
Indonesia	0.099	0.095	0.112	0.103	0.109	9%
Iceland	0.346	0.391	0.412	0.372	0.376	9%
Trinidad and Tobago	0.196	0.186	0.204	0.193	0.211	8%
Croatia	0.235	0.222	0.233	0.230	0.252	7%
Lithuania	0.116	0.124	0.127	0.123	0.124	7%
Serbia	0.145	0.133	0.146	0.143	0.154	6%
Mexico	0.099	0.103	0.107	0.097	0.106	6%
Hungary	0.138	0.130	0.142	0.133	0.146	5%
Luxembourg	0.531	0.521	0.551	0.556	0.554	4%
Moldova	0.091	0.090	0.098	0.090	0.095	4%
Algeria	0.082	0.073	0.085	0.080	0.085	4%
Guyana	0.068	0.061	0.067	0.063	0.070	3%
Dominican Rep.	0.090	0.085	0.093	0.082	0.092	3%
Poland	0.199	0.197	0.211	0.197	0.205	3%
El Salvador	0.128	0.118	0.134	0.124	0.132	3%
Honduras	0.117	0.109	0.119	0.115	0.120	2%
Turkey	0.230	0.227	0.241	0.213	0.235	2%
Jordan	0.167	0.155	0.174	0.169	0.168	1%
Bulgaria	0.223	0.206	0.220	0.212	0.223	0%
Colombia	0.154	0.144	0.157	0.145	0.154	0%
Peru	0.168	0.147	0.153	0.149	0.166	-1%
Fiji	0.167	0.166	0.180	0.158	0.166	-1%
Kazakhstan	0.097	0.095	0.094	0.091	0.096	-1%
Aruba	0.341	0.320	0.338	0.343	0.338	-1%
Slovenia	0.251	0.241	0.247	0.230	0.248	-1%
Chile	0.270	0.242	0.256	0.249	0.263	-3%
Brazil	0.261	0.227	0.252	0.227	0.254	-3%
Korea	0.613	0.597	0.609	0.589	0.596	-3%
Nicaragua	0.084	0.079	0.094	0.080	0.081	-3%
Italy	0.235	0.210	0.229	0.242	0.227	-3%
North Macedonia	0.191	0.168	0.186	0.173	0.184	-4%
Thailand	0.246	0.225	0.239	0.233	0.237	-4%
Bahamas	0.456	0.420	0.435	0.425	0.438	-4%
Argentina	0.162	0.162	0.172	0.156	0.156	-4%
Panama	0.318	0.291	0.307	0.293	0.305	-4%
Singapore	0.347	0.324	0.332	0.385	0.330	-5%
South Africa	0.223	0.215	0.220	0.201	0.212	-5%
Denmark	0.297	0.279	0.289	0.320	0.282	-5%
Austria	0.294	0.270	0.275	0.265	0.277	-6%
Norway	0.277	0.261	0.263	0.260	0.260	-6%
Barbados	0.341	0.373	0.323	0.305	0.319	-6%
Romania	0.115	0.103	0.111	0.103	0.108	-7%
Portugal	0.382	0.345	0.358	0.349	0.356	-7%

Belgium	0.369	0.332	0.361	0.347	0.343	-7%
Estonia	0.229	0.214	0.223	0.217	0.213	-7%
Australia	0.483	0.480	0.468	0.438	0.448	-7%
Czech Rep.	0.199	0.186	0.198	0.187	0.183	-8%
Brunei Darussalam	0.212	0.170	0.189	0.166	0.193	-9%
Finland	0.224	0.190	0.214	0.195	0.203	-9%
Spain	0.356	0.323	0.342	0.322	0.323	-9%
Latvia	0.164	0.152	0.162	0.144	0.148	-10%
Malaysia	0.269	0.234	0.250	0.233	0.243	-10%
Mozambique	0.071	0.068	0.068	0.059	0.063	-10%
Guatemala	0.124	0.109	0.120	0.107	0.111	-10%
Ireland	0.263	0.253	0.249	0.250	0.235	-11%
Greece	0.280	0.255	0.273	0.247	0.250	-11%
Sweden	0.298	0.272	0.278	0.280	0.265	-11%
Saudi Arabia	0.164	0.156	0.163	0.141	0.146	-11%
Kenya	0.096	0.085	0.092	0.085	0.083	-13%
Netherlands	0.296	0.253	0.269	0.256	0.254	-14%
Ukraine	0.197	0.181	0.186	0.146	0.162	-18%
Azerbaijan	0.116	0.087	0.084	0.071	0.087	-25%
Malawi	0.031	0.025	0.020	0.016	0.018	-42%

Source: Author's own computation

4.1.4 Trends in FI index – Banking, Life & Non-life insurance (FI_{BLNL})

After combining life-and-non-life-insurance, the number of countries whose relative change in FI indices is more than 50% reduces to 3, namely Uzbekistan, Cambodia, and China. The relative change is similar to those using banking-and-life-insurance and banking-and-non-life-insurance indicators. The similarity implies that life and non-life insurance are more dominant in determining the trend of the FI index. A total of 32 countries see their FI indices slightly increase by less than 50%, and only Uzbekistan's relative change in the FI index is larger than that using banking indicators only. Therefore, it could be seen as an indication that most countries lack emphasis on the insurance market development, especially life insurance. The rest countries either recorded 0 or negative change over the 5 years.

Table 4.4 The trend of the FI index using banking-life-and-non-life-insurance indicators (FI_{BLNL}) from 2015 to 2019

Country	2015	2016	2017	2018	2019	Relative Change in FI index (%)
Uzbekistan	0.032	0.047	0.071	0.076	0.092	189%
Cambodia	0.066	0.071	0.090	0.102	0.127	92%
China	0.198	0.200	0.227	0.331	0.353	78%
Paraguay	0.067	0.062	0.076	0.083	0.097	45%
Pakistan	0.023	0.024	0.030	0.032	0.033	42%
Uganda	0.009	0.007	0.011	0.010	0.012	38%
Namibia	0.194	0.253	0.260	0.253	0.250	29%
Albania	0.083	0.102	0.105	0.097	0.099	19%
Philippines	0.081	0.082	0.094	0.088	0.096	18%
Egypt	0.069	0.080	0.093	0.088	0.081	18%
Georgia	0.136	0.133	0.157	0.159	0.159	17%
Iceland	0.272	0.332	0.374	0.339	0.317	16%
Bolivia	0.073	0.072	0.083	0.083	0.085	15%
Costa Rica	0.165	0.164	0.187	0.189	0.183	11%
Ecuador	0.100	0.091	0.100	0.080	0.110	10%
Slovak Rep.	0.128	0.127	0.136	0.142	0.140	9%
Trinidad and Tobago	0.182	0.180	0.191	0.186	0.198	9%
Indonesia	0.092	0.090	0.104	0.100	0.100	9%
Mexico	0.092	0.096	0.098	0.096	0.099	8%
Croatia	0.204	0.195	0.205	0.210	0.221	8%
Serbia	0.120	0.112	0.121	0.127	0.128	7%
Moldova	0.076	0.076	0.083	0.081	0.080	6%
Guyana	0.056	0.051	0.056	0.057	0.059	5%
Luxembourg	0.505	0.507	0.527	0.533	0.530	5%
Algeria	0.063	0.056	0.065	0.064	0.066	5%
Hungary	0.128	0.121	0.131	0.127	0.132	3%
Dominican Rep.	0.076	0.073	0.079	0.075	0.079	3%
Lithuania	0.100	0.105	0.106	0.110	0.103	3%
Turkey	0.188	0.186	0.196	0.193	0.193	3%
Honduras	0.098	0.092	0.100	0.101	0.100	2%
Kazakhstan	0.083	0.082	0.081	0.085	0.085	2%
Jordan	0.137	0.127	0.144	0.143	0.139	1%
El Salvador	0.112	0.103	0.116	0.111	0.113	1%
Colombia	0.135	0.128	0.139	0.136	0.136	1%
Fiji	0.145	0.146	0.157	0.146	0.146	1%
Bulgaria	0.189	0.176	0.186	0.188	0.189	0%
Nicaragua	0.068	0.064	0.076	0.069	0.067	0%
Peru	0.153	0.134	0.139	0.142	0.152	0%
Aruba	0.325	0.315	0.328	0.333	0.324	0%

Poland	0.176	0.172	0.184	0.180	0.175	0%
Singapore	0.382	0.370	0.391	0.383	0.380	0%
Slovenia	0.217	0.209	0.215	0.217	0.215	-1%
Denmark	0.358	0.348	0.363	0.354	0.353	-1%
Brazil	0.218	0.191	0.211	0.214	0.212	-3%
North Macedonia	0.158	0.140	0.154	0.154	0.154	-3%
Thailand	0.236	0.222	0.234	0.232	0.228	-4%
Panama	0.275	0.252	0.266	0.264	0.266	-4%
Argentina	0.138	0.138	0.146	0.145	0.133	-4%
Chile	0.245	0.226	0.235	0.239	0.236	-4%
Bahamas	0.419	0.391	0.400	0.402	0.401	-4%
Korea	0.603	0.589	0.591	0.581	0.573	-5%
South Africa	0.259	0.251	0.252	0.239	0.245	-5%
Brunei Darussalam	0.180	0.150	0.161	0.153	0.170	-5%
Norway	0.280	0.268	0.265	0.259	0.263	-6%
Romania	0.098	0.089	0.095	0.094	0.092	-6%
Sweden	0.319	0.293	0.300	0.295	0.297	-7%
Portugal	0.360	0.333	0.347	0.345	0.335	-7%
Estonia	0.193	0.180	0.188	0.194	0.179	-7%
Italy	0.280	0.252	0.262	0.258	0.258	-8%
Belgium	0.353	0.322	0.342	0.334	0.326	-8%
Austria	0.282	0.258	0.259	0.258	0.256	-9%
Guatemala	0.100	0.089	0.098	0.095	0.091	-9%
Latvia	0.140	0.130	0.138	0.131	0.127	-9%
Greece	0.238	0.219	0.234	0.224	0.215	-10%
Malaysia	0.237	0.209	0.222	0.217	0.214	-10%
Czech Rep.	0.173	0.163	0.172	0.169	0.156	-10%
Finland	0.221	0.183	0.201	0.192	0.199	-10%
Spain	0.323	0.301	0.312	0.304	0.290	-10%
Saudi Arabia	0.137	0.130	0.136	0.124	0.122	-10%
Barbados	0.318	0.324	0.289	0.286	0.284	-11%
Mozambique	0.057	0.055	0.054	0.048	0.051	-11%
Kenya	0.082	0.074	0.080	0.078	0.073	-12%
Ireland	0.306	0.283	0.302	0.266	0.269	-12%
Ukraine	0.162	0.150	0.155	0.134	0.137	-15%
Netherlands	0.271	0.235	0.244	0.234	0.228	-16%
Australia	0.459	0.447	0.421	0.412	0.386	-16%
Azerbaijan	0.094	0.072	0.070	0.069	0.072	-23%
Malawi	0.028	0.023	0.019	0.017	0.018	-34%

Source: Author's own computation

4.1.5 Consolidation of FI index (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL})

The FI indices are consolidated in Table 4.5 to show the overall effects of life-and-non-life-insurance on financial inclusion. Section 4.1.4.1 to section 4.1.4.4 presents a cross-country analysis based on Table 4.5 to illustrate such differences.

Table 4.5 Consolidation of Financial Inclusion Indices (FI Indices) from 2015 to 2019 – Ranks Based on Different Categories of Insurance Indicators

Country	Banking (FI_B)		Banking + Life insurance (FI_{BL})		Banking + Non-life insurance (FI_{BNL})		Banking + Life + Non-life insurance (FI_{BLNL})	
	FI index	Rank	FI index	Rank	FI index	Rank	FI index	Rank
Albania	0.139	54	0.109	56	0.119	54	0.097	56
Algeria	0.101	67	0.076	71	0.081	72	0.063	73
Argentina	0.128	57	0.110	55	0.161	44	0.140	44
Aruba	0.332	11	0.317	8	0.336	9	0.325	10
Australia	0.395	3	0.377	4	0.463	3	0.425	3
Austria	0.191	38	0.195	29	0.276	16	0.263	17
Azerbaijan	0.117	59	0.088	63	0.089	68	0.075	70
Bahamas	0.371	6	0.348	6	0.435	4	0.403	4
Barbados	0.286	17	0.250	22	0.332	11	0.300	13
Belgium	0.354	8	0.336	7	0.350	7	0.335	8
Bolivia	0.103	65	0.087	65	0.091	67	0.079	66
Brazil	0.288	16	0.226	26	0.244	24	0.209	28
Brunei Darussalam	0.224	27	0.181	33	0.186	38	0.163	38
Bulgaria	0.229	26	0.189	31	0.217	31	0.186	34
Cambodia	0.148	49	0.120	51	0.112	57	0.091	61
Chile	0.297	15	0.263	18	0.256	20	0.236	23
China	0.331	12	0.295	13	0.286	14	0.262	19
Colombia	0.164	46	0.140	46	0.151	48	0.135	46

Country							
Costa Rica	0.223	28	0.180	34	0.209	33	0.177	36
Croatia	0.247	23	0.209	28	0.234	27	0.207	29
Czech Rep.	0.189	39	0.159	41	0.191	37	0.166	37
Denmark	0.155	48	0.308	10	0.294	13	0.355	6
Dominican Rep.	0.090	72	0.075	72	0.088	69	0.077	69
Ecuador	0.094	71	0.083	66	0.110	58	0.096	57
Egypt	0.135	56	0.107	57	0.100	62	0.082	64
El Salvador	0.141	51	0.119	52	0.127	52	0.111	52
Estonia	0.236	25	0.193	30	0.219	30	0.187	33
Fiji	0.185	40	0.155	42	0.167	42	0.148	41
Finland	0.182	41	0.174	37	0.205	34	0.199	30
Georgia	0.216	31	0.175	36	0.175	40	0.149	40
Greece	0.312	13	0.259	19	0.261	19	0.226	25
Guatemala	0.141	52	0.106	58	0.114	56	0.095	59
Guyana	0.077	74	0.060	74	0.066	75	0.056	74
Honduras	0.139	53	0.113	54	0.116	55	0.098	54
Hungary	0.136	55	0.124	49	0.138	51	0.128	50
Iceland	0.362	7	0.297	12	0.380	5	0.327	9
Indonesia	0.127	58	0.113	53	0.103	60	0.097	55
Ireland	0.241	24	0.288	15	0.250	21	0.285	14
Italy	0.220	30	0.264	17	0.229	29	0.262	18
Jordan	0.194	37	0.159	40	0.167	43	0.138	45
Kazakhstan	0.111	63	0.087	64	0.095	64	0.083	63
Kenya	0.096	70	0.081	68	0.088	70	0.077	67
Korea	0.525	2	0.518	2	0.601	1	0.587	1
Latvia	0.170	45	0.140	47	0.154	46	0.133	48
Lithuania	0.113	61	0.094	60	0.123	53	0.105	53
Luxembourg	0.579	1	0.526	1	0.543	2	0.520	2
Malawi	0.009	78	0.010	77	0.022	77	0.021	77
Malaysia	0.301	14	0.258	20	0.246	23	0.220	26
Mexico	0.102	66	0.091	62	0.102	61	0.096	58
Moldova	0.098	68	0.081	69	0.093	66	0.079	65
Mozambique	0.062	75	0.048	75	0.066	74	0.053	75
Namibia	0.284	19	0.271	16	0.250	22	0.242	22
Netherlands	0.276	21	0.250	23	0.266	17	0.242	21
Nicaragua	0.085	73	0.067	73	0.084	71	0.069	71
North Macedonia	0.208	33	0.168	39	0.180	39	0.152	39
Norway	0.208	34	0.226	25	0.264	18	0.267	15
Pakistan	0.043	76	0.038	76	0.030	76	0.029	76
Panama	0.338	10	0.291	14	0.303	12	0.265	16
Paraguay	0.105	64	0.081	67	0.094	65	0.077	68
Peru	0.171	44	0.152	43	0.156	45	0.144	43
Philippines	0.115	60	0.103	59	0.095	63	0.088	62
Poland	0.210	32	0.178	35	0.202	35	0.177	35

Portugal	0.385	5	0.363	5	0.358	6	0.344	7
Romania	0.112	62	0.092	61	0.108	59	0.094	60
Saudi Arabia	0.181	42	0.147	45	0.154	47	0.130	49
Serbia	0.157	47	0.124	50	0.144	50	0.122	51
Singapore	0.389	4	0.424	3	0.344	8	0.381	5
Slovak Rep.	0.146	50	0.131	48	0.149	49	0.134	47
Slovenia	0.222	29	0.182	32	0.243	25	0.215	27
South Africa	0.206	35	0.245	24	0.214	32	0.249	20
Spain	0.344	9	0.308	9	0.333	10	0.306	11
Sweden	0.280	20	0.300	11	0.279	15	0.301	12
Thailand	0.269	22	0.253	21	0.236	26	0.230	24
Trinidad and Tobago	0.180	43	0.171	38	0.198	36	0.187	32
Turkey	0.284	18	0.214	27	0.229	28	0.191	31
Uganda	0.011	77	0.009	78	0.012	78	0.010	78
Ukraine	0.196	36	0.151	44	0.174	41	0.148	42
Uzbekistan	0.098	69	0.076	70	0.075	73	0.063	72

Source: Author's own computation

4.1.5.1 Financial Inclusion Index – Banking (FI_B)

The FI index computed using banking indicators serves as the baseline as the formal banking system has been the key driver of financial inclusion for the past decades. It is also the most commonly used by scholars to measure the degree of financial inclusion (Sarma, 2004; Beck et al., 2007).

In the 78 countries for which the 3-dimensional FI index has been estimated using banking data only, as shown in Column 1 of Table 4.5, Luxembourg leads with the highest value of the FI index. According to the standard Sarma (2008) set, Luxembourg and Korea are the only countries with high financial inclusion (FI index values of 0.5 or more). Luxembourg's high financial inclusion could be attributed to the launching of Appui au Développement Autonome (ADA) 25 years ago. ADA is an organisation

dedicated to reducing poverty by providing the concerned populations, mainly small and medium enterprises, with responsible financial and technical solutions adapted to their needs. Therefore, Luxembourg recorded a high banking-related only FI index as ADA plays the role of a catalyst to generate, identify, develop and implement solutions that facilitate inclusive financial development in the country. Meanwhile, Korea has a highly developed financial system, including Asia's third-largest insurance and banking markets. Its strong fundamentals and active regulation underpin the stability of Korea's banking sector.

Another 12 countries, including Australia, Singapore, Portugal, Bahamas, Iceland, Belgium, Spain, Panama, Aruba, China, Greece, and Malaysia, form the group of countries with medium financial inclusion with FI indices ranging between 0.3 and 0.5. Australia, Portugal, Iceland, Belgium, Spain, and Greece are OECD members, where financial services have long supported their economic growth. OECD members have continuously promoted an efficient, open, stable, sound, and market-oriented financial system that allows people to go beyond rudimentary transactions and accumulate savings. Another contributor to the financial inclusion seen in countries like Portugal and Singapore could be their pro-business and cost-competitive environment, making them international financial hubs which attract a large volume of non-resident banking activities.

Except for Malaysia and China, all these countries belong to the high-income country group; there could be an association between national income

and financial inclusion, as suggested by the literature (Khan et al., 2021). Malaysia, although being a middle-income country, has one of the highest financial inclusion levels in Southeast Asia and appears as a better performer in terms of banking-related financial inclusion than others, even surpassing most OECD countries (Norway – 34th and Austria – 38th), raising doubt on the notion that developed country has higher financial inclusion level. Malaysia's high financial inclusion results from the effort of many authorities in Malaysia to ensure long-sustainable growth through higher financial inclusivity. Meanwhile, as the second-largest economy, China has experienced rapid development and enhancement of its financial system. Given the fast-paced development, reform, and transformation of the financial sector, more financial services are made available for individuals, companies, and low-income groups.

The rest of the countries in the sample have low FI index values, ranging between 0.009 and 0.297. Interestingly, some belong to high-income countries like Iceland, Ireland, Italy, Poland, and Finland. One possible reason could be the disruptions in the financial market and residents switching to services provided by Fintech companies ranging from crowdfunding platforms, sharing economy, and peer-to-peer lending to payment services and services comparing loans. Meanwhile, financial inclusion remains low in most of the ASEAN countries like Thailand (22nd), Brunei (27th), Cambodia (49th), and Indonesia (60th). Such low readings for FI indices of ASEAN countries call for greater effort and attention toward establishing regional financial cooperation that targets accelerating financial inclusion.

Some of the least-developed African countries like Mozambique (75st), Uganda (77th), and Malawi (78th) rank the lowest among the 78 countries, with the FI Index of 0.062, 0.011, and 0.009, respectively. African countries contribute the largest percentage of the world's unbanked and underbanked. Financial exclusion remains a key challenge in the Asian and African regions, where the benefits of broadening financing options are not shared equally.

4.1.5.2 Financial Inclusion Index – Banking-and-life-insurance (FI_{BL})

Column 2 of Table 4.5 shows the FI index for 78 countries by incorporating banking and life insurance indicators. When life insurance is considered in computing the FI index, some countries witness a soar, whereas others see a plummet in their FI indices. The high financial inclusion group members remain at 2, where Luxembourg ranked first, followed by Korea. Singapore is the only major beneficiary of life insurance in Southeast Asia, given its ranking increases from 4th to 3[rd,] with a marginal increase in its FI index. Singapore is the region's most developed and highly concentrated insurance market, with the top 10 insurers accounting for 95% of the market share in 2019, driven by heightened demand for life insurance products. Approximately 71% of Singapore residents – or 2.85 million lives – are under the protection of Integrated Shield Plans (IPs) and riders on top of MediShield Life (Olano, 2022).

Denmark and Italy are the higher-income countries that reap the benefits of the flourishing of their life insurance industry, and their rankings leap from 48th to 6th and 30th to 17th, with the main products being with-profit and unit-

linked savings policies. The result shows that the life insurance domain is heavily emphasised compared to the banking industry in these countries.

In developed countries like Belgium, Sweden, and the Netherlands, their FI indices plunge when life insurance is considered. This could be due to the universal social welfare system that provides a safety net for residents residing in the European region. As a result, the importance of insurance is weighed down. Besides, the European insurance industry has remained in a low-growth mode for over a decade (Manchester, 2019). Growth rates have been negligible or negative in major markets, and underlying economic fundamentals appear shaky.

China's FI index and ranking also dropped after adding insurance indicators. The Chinese government's campaign against financial risk implies a drop in life insurance premiums, which forces insurers to phase out products that have underpinned their competitiveness (Costa, 2021). Asian countries, including Malaysia, Brunei, Indonesia, and Philippines, also decline in FI indices. Despite being the fastest-growing insurance market globally, banking sectors remain dominant in delivering financial services in the region. Lastly, due to low insurance uptake, African countries' financial inclusion is primarily unaffected by life insurance.

Overall, the number of high financial inclusion group and moderate financial inclusion group members see invariance. Although rankings are unchanged, most countries witness a remarkable contraction in their FI indices.

Turkey, Malaysia, and Greece are put up with the biggest adversity. The beneficiary includes Denmark, Italy, Singapore, South Africa, and Sweden, due mainly to equities allocation in their life insurance sector. The rest of the countries remain in the low financial inclusion group.

4.1.5.3 Financial Inclusion Index – Banking-and-non-life-insurance (FI_{BNL})

Column 3 of Table 4.5 presents the FI indices for 78 countries by including non-life insurance in the baseline index. For over a decade, the Korean life insurance industry has grown at an extraordinary average growth rate of 13% per year, pausing only in 1998 during the Asian financial crisis (Achugamonu et al., 2020). During the COVID-19 pandemic, Korea's leading insurance firms offered customised healthcare services through digital platforms, resulting in a more than 37% jump in the insurance companies' earnings nine months into the first pandemic outbreak in 2019 (Asia Insurance Review, 2021) attributed to the high volume of new business. After considering non-life insurance, the FI index for Korea spurs from 0.525 to 0.601 and ranks at the top, further reinforcing the importance of insurance among Koreans. However, Han-na (2021) cautioned that insurers in Korea must continue discovering new revenue sources amid the rapid growth of the elderly population to continue reaping the benefits of financial inclusion.

Singapore's FI index plummets from 0.389 to 0.344, with its ranking dropping from 4th to 8th. The drop in Singapore's FI index depicts that its life insurance domain plays a more critical role in supporting the insurance industry.

A substantial increment of more than 5% in the FI index is recorded by Denmark and Bahamas, implying that non-life insurance is widely accepted among the people in these two countries, and their insurance markets are characterised by strong competition for consumers. As a result, a drop in ranking is recorded by China despite its FI index remaining consistent.

It is important to note that non-life insurance does not benefit most countries in terms of their financial inclusion level. For example, Malaysia's ranking drops from 14th to 23rd due to its flat premium growth relative to other countries. The sluggish sales (Malaysian Reinsurance Berhad, 2020) have brought to stark attention the urgency to extend the coverage for Malaysians to ensure the quality of their healthcare and financial security is unaffected. African countries maintain the lowest financial inclusion worldwide, with or without insurance. Despite a decline in FI indices among many countries, the overall impact is more optimistic than the FI index using banking and banking-and-life-insurance indicators. While the high financial inclusion group members remain, the moderate financial inclusion group members increased from 9 (Singapore, Australia, Portugal, Bahamas, Belgium, Aruba, Spain, Denmark & Sweden) to 10 (Australia, Bahamas, Iceland, Portugal, Belgium, Singapore, Aruba, Spain, Barbados & Panama).

4.1.5.4 Financial Inclusion Index – Banking-life-and-non-life-insurance (FI_{BLNL})

Column 4 of Table 5 illustrates the FI indices for 78 countries by incorporating both life and non-life insurance. Overall, the results are similar to the FI index considering only a single insurance domain, only that the number of countries in the moderate financial inclusion group increases and the ranking varies slightly. For instance, the ranking for the top 4 highest FI indices agrees with the ranking of FI indices using non-life insurance, then goes from Singapore, Denmark, and Denmark, whereas, for the latter, the ranking goes from Portugal, Singapore, and Denmark.

There is a great similarity between the FI index using only non-life insurance and the FI index using both life and non-life insurance, indicating that non-life insurance plays a more dominant role in the insurance sector as the driver of financial inclusion. Meanwhile, adding a life insurance indicator to the FI index could dampen the score for most countries. Compared to the FI index computed using only banking indicators, Denmark, Sweden, and Barbados leap from the low to moderate financial inclusion group. Lastly, the opposite is true for Panama.

4.1.6 Cross-country Comparisons of Absolute Differences in FI indices (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL})

A more detailed absolute difference after incorporating life insurance, non-life insurance, and life-and-non-life-insurance is provided in Table 4.6. For life insurance, Denmark (0.15) is the only country that records a growth spurt in their FI indices of more than 0.05. This implies that the life insurance market is one of the vital growth drivers of the financial services sector in Denmark, apart from the banking industry. As a result, governments and private sectors must look at policy options to improve the stability and sustainability of the sector. Another 8 countries also witness a modest increase in their FI indices of less than 0.05.

Most countries experience a slight decline in their FI indices at a smaller magnitude because the recovery of the insurance industry is highly correlated with that of the overall economy. Any reduction in the size of the economy because of the fall in productive activities and the increase in unemployment could adversely affect premium income to life insurers. Innovative initiatives accompanied by well-reasoned digital strategies are crucial to driving the insurance industry toward new services and business models.

There are 5 countries whose FI indices increase more than 0.05 after including non-life insurance as part of their FI indices. These countries are Denmark (0.13), Austria (0.08), Barbados (0.14), Korea (0.07), Australia (0.06), Bahamas (0.06), and Norway (0.05). Meanwhile, as many as 17 countries see a

significant increase of less than 0.05. Despite prevailing economic headwinds, non-life insurance is in a strong position to capitalise on growing global demand and stable macroeconomic fundamentals. The FI level remains flat for 2 countries, including developing countries like Mexico and least-developed countries like Uganda. Identical to life insurance, other countries see a tailspin in their FI indices after incorporating non-life insurance. However, an important implication is that risk awareness is higher among consumers and businesses following the shock of COVID-19. Given its capacity and expertise in absorbing risks, non-life insurance must be emphasised to make societies and economies more resilient.

By combining life and non-life insurance, a significant elevation is observed by 16 countries in their FI indices. Denmark (0.2) claims the triumph, followed by Austria (0.07), Korea (0.06), and Norway (0.06), whilst the others, *i.e.* 12 countries, lie lower than 0.05. These figures are remarkable and signify the importance of insurance as a whole as an integral part of the push for financial inclusion. The rest countries see a slight decline in their FI indices. China and Malaysia's drop in the FI index is one of the most prevalent - more than 0.05. This presents challenges and opportunities for developing countries to integrate insurance into their financial inclusion.

In short, life and non-life insurance have played a prominent role in upholding financial inclusion. Nonetheless, non-life insurance appears to have only a marginally positive impact on overall financial inclusivity in the sample countries, whereas the impact of life insurance is even more limited. This

indicates a lack of contribution of the insurance spectrum of financial services to financial inclusion, especially life insurance. In the efforts to promote financial inclusion, countries must focus on their insurance industry to ensure a holistic development that best safeguards their people's interests are prioritised.

Table 4.6 Absolute difference in Financial Inclusion Index between banking (FI_B), banking-and-life-insurance (FI_{BL}), banking-and-non-life-insurance (FI_{BNL}), and banking-life-and-non-life-insurance (FI_{BLNL})

Country	Banking (FI_B)	Banking & Life insurance (FI_{BL})	Banking & Non-life insurance (FI_{BNL})	Banking, Life & Non-life insurance (FI_{BLNL})	Absolute difference between FI_B & FI_{BL}	Absolute difference between FI_B & FI_{BNL}	Absolute difference between FI_B & FI_{BLNL}
Albania	0.139	0.109	0.119	0.097	-0.030	-0.020	-0.041
Algeria	0.101	0.076	0.081	0.063	-0.025	-0.020	-0.038
Argentina	0.128	0.110	0.161	0.140	-0.018	0.033	0.012
Aruba	0.332	0.317	0.336	0.325	-0.015	0.004	-0.007
Australia	0.395	0.377	0.463	0.425	-0.017	0.069	0.030
Austria	0.191	0.195	0.276	0.263	0.004	0.085	0.072
Azerbaijan	0.117	0.088	0.089	0.075	-0.030	-0.028	-0.042
Bahamas	0.371	0.348	0.435	0.403	-0.023	0.064	0.032
Barbados	0.286	0.250	0.332	0.300	-0.036	0.046	0.014
Belgium	0.354	0.336	0.350	0.335	-0.017	-0.003	-0.018
Bolivia	0.103	0.087	0.091	0.079	-0.017	-0.012	-0.025
Brazil	0.288	0.226	0.244	0.209	-0.063	-0.044	-0.079
Brunei Darussalam	0.224	0.181	0.186	0.163	-0.043	-0.039	-0.061
Bulgaria	0.229	0.189	0.217	0.186	-0.040	-0.012	-0.043
Cambodia	0.148	0.120	0.112	0.091	-0.028	-0.036	-0.056

Chile	0.297	0.263	0.256	0.236	-0.034	-0.041	-0.061
China	0.331	0.295	0.286	0.262	-0.036	-0.045	-0.069
Colombia	0.164	0.140	0.151	0.135	-0.023	-0.013	-0.029
Costa Rica	0.223	0.180	0.209	0.177	-0.042	-0.014	-0.045
Croatia	0.247	0.209	0.234	0.207	-0.038	-0.013	-0.040
Czech Rep.	0.189	0.159	0.191	0.166	-0.030	0.002	-0.022
Denmark	0.155	0.308	0.294	0.355	0.153	0.139	0.200
Dominican Rep.	0.090	0.075	0.088	0.077	-0.015	-0.002	-0.013
Ecuador	0.094	0.083	0.110	0.096	-0.011	0.016	0.002
Egypt	0.135	0.107	0.100	0.082	-0.028	-0.035	-0.053
El Salvador	0.141	0.119	0.127	0.111	-0.022	-0.014	-0.030
Estonia	0.236	0.193	0.219	0.187	-0.044	-0.017	-0.050
Fiji	0.185	0.155	0.167	0.148	-0.030	-0.018	-0.037
Finland	0.182	0.174	0.205	0.199	-0.008	0.024	0.017
Georgia	0.216	0.175	0.175	0.149	-0.041	-0.041	-0.067
Greece	0.312	0.259	0.261	0.226	-0.054	-0.051	-0.086
Guatemala	0.141	0.106	0.114	0.095	-0.035	-0.026	-0.046
Guyana	0.077	0.060	0.066	0.056	-0.017	-0.011	-0.021
Honduras	0.139	0.113	0.116	0.098	-0.026	-0.023	-0.041
Hungary	0.136	0.124	0.138	0.128	-0.012	0.002	-0.008
Iceland	0.362	0.297	0.380	0.327	-0.065	0.017	-0.036
Indonesia	0.127	0.113	0.103	0.097	-0.014	-0.023	-0.030
Ireland	0.241	0.288	0.250	0.285	0.046	0.009	0.044
Italy	0.220	0.264	0.229	0.262	0.044	0.009	0.042

Jordan	0.194	0.159	0.167	0.138	-0.035	-0.027	-0.056
Kazakhstan	0.111	0.087	0.095	0.083	-0.024	-0.016	-0.028
Kenya	0.096	0.081	0.088	0.077	-0.016	-0.008	-0.019
Korea	0.525	0.518	0.601	0.587	-0.007	0.076	0.063
Latvia	0.170	0.140	0.154	0.133	-0.030	-0.016	-0.036
Lithuania	0.113	0.094	0.123	0.105	-0.019	0.010	-0.008
Luxembourg	0.579	0.526	0.543	0.520	-0.053	-0.036	-0.058
Malawi	0.009	0.010	0.022	0.021	0.002	0.014	0.012
Malaysia	0.301	0.258	0.246	0.220	-0.043	-0.055	-0.081
Mexico	0.102	0.091	0.102	0.096	-0.011	0.000	-0.006
Moldova	0.098	0.081	0.093	0.079	-0.018	-0.006	-0.019
Mozambique	0.062	0.048	0.066	0.053	-0.014	0.004	-0.009
Namibia	0.284	0.271	0.250	0.242	-0.013	-0.034	-0.042
Netherlands	0.276	0.250	0.266	0.242	-0.026	-0.010	-0.033
Nicaragua	0.085	0.067	0.084	0.069	-0.018	-0.001	-0.016
North Macedonia	0.208	0.168	0.180	0.152	-0.041	-0.028	-0.056
Norway	0.208	0.226	0.264	0.267	0.019	0.057	0.060
Pakistan	0.043	0.038	0.030	0.029	-0.005	-0.012	-0.014
Panama	0.338	0.291	0.303	0.265	-0.048	-0.036	-0.074
Paraguay	0.105	0.081	0.094	0.077	-0.024	-0.011	-0.028
Peru	0.171	0.152	0.156	0.144	-0.019	-0.015	-0.027
Philippines	0.115	0.103	0.095	0.088	-0.013	-0.021	-0.027
Poland	0.210	0.178	0.202	0.177	-0.032	-0.008	-0.032
Portugal	0.385	0.363	0.358	0.344	-0.023	-0.027	-0.041

Romania	0.112	0.092	0.108	0.094	-0.020	-0.004	-0.018
Saudi Arabia	0.181	0.147	0.154	0.130	-0.034	-0.027	-0.051
Serbia	0.157	0.124	0.144	0.122	-0.034	-0.013	-0.036
Singapore	0.389	0.424	0.344	0.381	0.035	-0.045	-0.008
Slovak Rep.	0.146	0.131	0.149	0.134	-0.015	0.002	-0.012
Slovenia	0.222	0.182	0.243	0.215	-0.039	0.022	-0.007
South Africa	0.206	0.245	0.214	0.249	0.038	0.008	0.043
Spain	0.344	0.308	0.333	0.306	-0.035	-0.011	-0.038
Sweden	0.280	0.300	0.279	0.301	0.020	-0.001	0.021
Thailand	0.269	0.253	0.236	0.230	-0.016	-0.033	-0.039
Trinidad and Tobago	0.180	0.171	0.198	0.187	-0.008	0.018	0.007
Turkey	0.284	0.214	0.229	0.191	-0.070	-0.055	-0.093
Uganda	0.011	0.009	0.012	0.010	-0.003	0.000	-0.001
Ukraine	0.196	0.151	0.174	0.148	-0.045	-0.022	-0.048
Uzbekistan	0.098	0.076	0.075	0.063	-0.022	-0.023	-0.034

Source: Author's own computation

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4.2 Financial Inclusion and Sustainable Development

A correlation analysis is carried out as a preliminary examination of the relationship between financial inclusion (F_B, F_{BL}, F_{BNL} & F_{BLNL}) and sustainable development.

4.2.1 Correlation Analysis

The correlation between the variables of this study was reported in Table 4.7 to identify the presence of multicollinearity problems before the regression analysis. The coefficients of all the variables are less than 0.8, suggesting a serious multicollinearity problem is non-existent (Gujarati & Porter, 2009). However, for the FI indices, the high multicollinearity (coefficient more than 0.8) among the FI indices is intuitive and reasonable as they are interrelated.

Table 4.7 Correlations among the variables

	SDG	INF	INT	POP	TRADE	F_B	F_{BL}	F_{BNL}	F_{BLNL}
SDG	1.000								
INF	-0.4108	1.000							
INT	-0.2235	0.1014	1.000						
POP	-0.4294	0.1700	0.1591	1.000					
TRADE	0.2903	-0.2031	-0.2271	-0.3442	1.0000				
F_B	0.4958	-0.3847	-0.0902	-0.0982	0.2067	1.0000			
F_{BL}	0.5045	-0.3900	-0.1497	-0.1002	0.2827	0.9743	1.0000		
F_{BNL}	0.5457	-0.3754	-0.1318	-0.1206	0.1735	0.9580	0.9634	1.0000	
F_{BLNL}	0.5337	-0.3729	-0.1592	-0.1206	0.2214	0.9473	0.9733	0.9893	1.0000

Source: Author's own computation

4.3 Estimation Results

This study used a regression analysis to examine the effects of financial inclusion on sustainable development. Firstly, financial inclusion proxied by the FI index entered the regression models with the 7 finance-related SDGs separately. The best models are identified and reported in Table 4.8 to Table 4.14. Then, the SDGs are combined into a finance-related SDG index to measure the overall effects of financial inclusion on sustainable development.

4.3.1 Financial Inclusion and Poverty Reduction (SDG 1)

Table 4.8 illustrates the relationship between poverty reduction (SDG1), financial inclusion, and other independent variables using 4 sets of panel models - the first model refers to financial inclusion using banking indicators (FI_B), the second model uses banking-and-life-insurance indicators (FI_{BL}), the third model uses banking-and-non-life-insurance indicators (FI_{BNL}), and the last model using banking-life-and-non-life-insurance indicators (FI_{BLNL}). As the diagnostic tests show that FE models are the best suitable models, all results will be interpreted using FE models.

It is observed that none of the models shows a significant relationship between the FI index and poverty reduction. Hence, $H1_a$ is not rejected. The results contradict the empirical findings of Omar and Inaba (2020) and Polloni-Silva et al. (2021), which show that financial inclusion is conducive to poverty reduction. In theory, financial inclusion would benefit low-income individuals,

as having greater access to bank accounts facilitates their financial transactions and provides a safe repository for their savings. However, this might not always be the case in practice because poor individuals might not need formal financial services, and financial inclusion might even result in over-indebtedness by individuals as their interest rates tend to be higher if they are unable to provide collateral. However, policymakers often overlook the inherently high costs of financial services and the need for formal finance.

In a study, Inoue (2018) also established that financial inclusion had no impact on poverty reduction in the private sector of India during 1973–2004. A possible reason for ineffective poverty reduction through financial inclusion is indicated by Gopalan and Rajan (2018), who examined the impact of foreign bank presence on financial inclusion for 50 developing countries, including India, between 2004 and 2009. They found that although foreign banks increase access to finance, they reduce the usage of such financial services. Therefore, a non-significant impact of financial inclusion on poverty reduction could be due to some sample countries having foreign banks.

Table 4.8 Impacts of financial inclusion on poverty reduction (SDG 1)

VARIABLES	FEM			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)
Constant	52.91** (20.77)	68.13*** (22.34)	61.28*** (21.60)	48.79** (22.85)

INF	0.20	0.21	0.25	0.19
	(0.319)	(0.313)	(0.319)	(0.320)
INT	1.97*	1.76	2.03*	1.97*
	(1.070)	(1.066)	(1.065)	(1.068)
POP	9.75	7.78	8.83	10.08
	(6.191)	(6.171)	(6.130)	(6.148)
TRADE	0.18	0.15	0.18	0.18
	(0.221)	(0.218)	(0.218)	(0.219)
FII	-0.08	-56.68	-46.24	23.61
	(39.04)	(40.77)	(50.06)	(66.50)
Poolability F-test	9.86***	10.32***	10.12***	10.07***
BP LM test	63.31***	62.27***	63.34***	63.89***
Hausman test	20.42***	49.85***	24.65***	20.63***
Adjusted R-squared	0.11	0.13	0.01	0.01
F-statistic	1.86	2.29*	2.05*	1.89
Wald chi2(8)	12.46**	10.39*	11.45**	12.06**
Prob > chi2				
Number of obs	234	234	234	234

Notes:
1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.2 Financial Inclusion and Zero Hunger (SDG 2)

Table 4.9 displays the relationship between zero hunger (SDG2), financial inclusion, and other independent variables based on 4 sets of panel models (B, BL, BNL & BLNL). The results of poolability F-test, Breusch-Pagan LM test, and Hausman test reveal that the RE models are best for B, BL, BNL, and BLNL. Hence, only RE models are present in Table 4.9.

The findings from models 1-4 reject $H2_a$ and show a significant and positive relationship between financial inclusion and zero hunger, supporting

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Cai et al. (2021) and Peng and Xu (2019). In their analysis, the broadening of finance access to farmers contributes to large-scale agricultural production and industrialisation, especially in China, where agriculture is undergoing a rapid revolution. With more financial resources made available to farmers, they can invest in machines for production to increase their yields. Higher yields enhance the stability of the global food supply and contribute to the economic growth of predominantly emerging countries whose economies are based on agriculture.

Turning to insurance services, insurance allows farmers to involve in more risky and higher-return investments, leading to higher yields. Compared to the FI index using only banking indicators, the insurance-adjusted FI index shows a larger coefficient, suggesting that insurance complements the FI index in upholding the battles to end hunger. A study in Ghana by Innovations for Poverty Action (2012) also found that insurance is more effective than credit lending in encouraging investment in agricultural production. Thus, the findings support the existing literature demonstrating the role of financial inclusion in ending hunger.

Table 4.9 Impacts of financial inclusion on ending hunger (SDG 2)

VARIABLES	REM			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)
Constant	49.55*** (3.537)	50.00*** (3.471)	50.03*** (3.509)	49.59*** (3.408)

INF	-0.21	-0.18	-0.21	-0.20
	(0.136)	(0.138)	(0.138)	(0.136)
INT	0.22	0.27	0.24	0.27
	(0.203)	(0.202)	(0.201)	(0.199)
POP	-3.56***	-3.59***	-3.54***	-3.58***
	(1.108)	(1.098)	(1.098)	(1.081)
TRADE	0.02	0.02	0.02	0.02
	(0.0239)	(0.0238)	(0.0235)	(0.0233)
FII	31.50***	31.52***	29.02***	36.01***
	(9.328)	(9.486)	(9.278)	(9.719)
Poolability F-test	13.57***	12.96***	12.29***	12.34***
BP LM test	77.35***	74.79***	70.31***	30.73***
Hausman test	3.13	3.10	3.56***	3.29
Adjusted R-squared	0.06	0.04	0.02	0.04
F-statistic	1.34	1.16	0.73	1.21
Wald chi2(8)	34.90***	35.05***	33.94***	38.57***
Prob > chi2				
Number of obs	234	234	234	234

Notes:

1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.3 Financial Inclusion, Good Health, and Well-being (SDG 3)

Repeating the steps earlier, poolability F-test, Breusch-Pagan LM test, and Hausman test are carried out to determine the best suitable models for the relationship between good health and well-being and financial inclusion. The results are reported in Table 4.10 using 4 sets of FE models (B, BL, BNL & BLNL).

From Table 4.10, none of the coefficients shows a significant relationship between good health, well-being, and financial inclusion. Hence,

H3$_0$ is not rejected. The results echo the findings of Veenhoven (2000), who found no significant relationship between social insurance as part of financial inclusion and people's well-being, but contradict the findings of Sakyi-Nyarko et al. (2021) and Laha and Sen (2021), who found financial inclusion to induce better health and well-being. As Bovbjerg and Hadley (2007) posited, insurance and better safety nets alone are insufficient for better health and longevity.

A possible reason for this study's missing linkage between financial inclusion and health-related well-being could be due to other factors unconsidered. For example, the lack of financial literacy. Mere possession of a bank account might not necessarily lead to greater health among the population. Besides, having insurance might result in moral hazard among the insured, where they tend to involve in risks taking behaviour such as practising a poor eating habit when their health coverage is present. Hence, it is recommended that apart from providing access to finance, the government has an important role in pushing for environmental and public health measures, such as free vaccinations, a smoking ban, and weight control.

Table 4.10 Impacts of financial inclusion on well-being (SDG 3)

VARIABLES	FEM			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)
Constant	73.78*** (4.456)	74.22*** (4.897)	75.06*** (4.646)	73.07*** (4.923)

INF	0.01	0.01	0.02	0.01
	(0.0686)	(0.0681)	(0.0685)	(0.0690)
INT	0.06	0.04	0.08	0.06
	(0.217)	(0.219)	(0.216)	(0.217)
POP	0.42	0.41	0.34	0.56
	(1.337)	(1.350)	(1.324)	(1.332)
TRADE	0.01	0.01	0.01	0.01
	(0.0479)	(0.0480)	(0.0475)	(0.0478)
FII	-4.76	-4.46	-11.33	-0.45
	(8.424)	(8.979)	(10.81)	(14.39)
Poolability F-test	136.94***	138.56***	130.35***	133.54***
BP LM test	108.61***	107.68***	109.03***	110.20***
Hausman test	57.53***	10.67***	11.42***	13.11***
Adjusted R-squared	0.01	0.01	0.02	0.01
F-statistic	0.15	0.13	0.30	0.08
Wald chi2(8)	8.87	8.85	10.51*	14.00**
Prob > chi2				
Number of obs	234	234	234	234

Notes:

1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.4 Financial Inclusion and Gender Equality (SDG 5)

After being identified as the best models, RE models (B, BL, BNL & BLNL) are presented in Table 4.11. All four models show a positive and significant relationship between financial inclusion and gender equality, rejecting $H4_a$. In their studies, Robino et al. (2018) show that closing the gender gap in financial inclusion could have positive effects in helping women to smooth their consumption, lower their financial costs, provides them with security, promotes their savings rates, and start new businesses. Allowing women to access more

financial options can contribute to growth by encouraging women to participate in entrepreneurship.

Besides, better access to and use of financial services not only allow women-led businesses to grow faster and more sustainable but also increases women's autonomy, which allows them to make better decisions they would not have made in the absence of financial resources. Evidence that financial inclusion substantially reduces gender inequality is also shown by Ohiomu and Ogbeide-Osaretin (2019) using data in SSA. Whether they work at home or in the workplace, financial inclusion provides women with the tools to manage risks and generate income through active participation in the labour market.

Although having an overall positive effect on promoting gender equality, the effects are disproportionate across different financial services and magnified when other financial services, *i.e.* insurance, are considered. For example, life insurance contributes largely to the increase in the coefficient, whereas non-life insurance only has a marginal positive impact. The findings could be that although earning less than their male peers, their income has become important to uphold a household's financial stability, as more women are stepping into the workforce and becoming breadwinners. Given that more households might face financial hardship when women are absent, the contribution of life insurance is deemed more critical than non-life insurance in functioning as a safety net.

Table 4.11 Impacts of financial inclusion on gender equality (SDG 5)

VARIABLES	REM			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)
Constant	80.38***	79.73***	79.63***	81.02***
	(4.677)	(4.575)	(4.708)	(4.592)
INF	-0.08	-0.02	-0.07	-0.08
	(0.230)	(0.227)	(0.227)	(0.230)
INT	-0.32	-0.25	-0.28	-0.27
	(0.265)	(0.266)	(0.268)	(0.267)
POP	-5.78***	-5.80***	-5.60***	-5.74***
	(1.445)	(1.445)	(1.461)	(1.450)
TRADE	0.01	0.01	0.01	0.01
	(0.0304)	(0.0308)	(0.0307)	(0.0306)
FII	39.12***	47.99***	42.70***	40.07***
	(12.61)	(12.84)	(12.42)	(12.92)
Poolability F-test	6.67***	7.14***	7.12***	6.69***
BP LM test	52.12***	53.37***	51.71***	51.10***
Hausman test	5.46	7.82	8.67	6.07
Adjusted R-squared	0.02	0.06	0.04	0.01
F-statistic	1.29	2.54**	2.40**	1.42
Wald chi2(8) Prob > chi2	38.11***	42.21***	39.47***	37.87***
Number of obs	234	234	234	234

Notes:
1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.5 Financial Inclusion and Economic Growth (SDG 8)

Turning to Table 4.12, the relationship between financial inclusion and economic growth is insignificant in models 1 and 4, but models 2 and 3, which include life insurance and non-life insurance, show a positive yet significant relationship. Hence, $H5_a$ is rejected. The findings recommended that the impact of financial inclusion on economic growth can be conditional on the applicability of a specific financial service. Although it contradicts the findings from Ifediora et al. (2022) and Sethi and Setty (2018), which found a positive and significant relationship between financial inclusion and economic growth, it is noteworthy that economic growth in this study consists not only GDP, but other macroeconomics indicators as well such as youth unemployment and modern slavery. Although an increase in banking accessibility, availability of banking outlets, and geographical penetration contribute to a given country's GDP, they might not necessarily improve youth employment if the distribution of finance is unequal.

As such, financial services are crucial underlying significant positive impacts of financial inclusion on sustainable economic growth. For example, Ward and Zurbruegg (2000), the first to explore the impact of insurance on economic growth in OECD countries using the total insurance premium as their proxy, revealed that the relationship is significant in some OECD countries. In the same vein, Kugler and Ofoghi (2005), who used disaggregated data, found a positive association between insurance and economic growth. Therefore, governments need to emphasise different segments of financial inclusion, *i.e.*

insurance, to avoid monotonicity in financial services when promoting robust economic growth.

Table 4.12 Impacts of financial inclusion on economic growth (SDG 8)

VARIABLES	FEM			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)
Constant	100.40***	74.93***	91.13***	93.62***
	(23.73)	(25.06)	(24.60)	(26.20)
INF	-0.56	-0.50	-0.60	-0.56
	(0.365)	(0.349)	(0.363)	(0.367)
INT	-3.21***	-2.66**	-3.33***	-3.15***
	(1.154)	(1.121)	(1.145)	(1.155)
POP	-14.62**	-12.03*	-14.35**	-15.09**
	(7.122)	(6.905)	(7.013)	(7.090)
TRADE	-0.09	0.01	-0.06	-0.05
	(0.255)	(0.246)	(0.251)	(0.255)
FII	62.23	130.50***	107.80**	98.51
	(44.86)	(45.94)	(57.26)	(76.58)
Poolability F-test	2.82***	3.11***	2.80***	2.75***
BP LM test	12.86***	13.88***	11.40***	11.65***
Hausman test	11.19**	14.75**	13.13**	11.88**
Adjusted R-squared	0.23	0.29	0.25	0.23
F-statistic	4.46***	6.02***	4.87***	4.39***
Wald chi2(8)	48.43***	51.34***	51.10***	49.65***
Prob > chi2				
Number of obs	234	234	234	234

Notes:
1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.6 Financial Inclusion, Industry, Innovation, and Infrastructure (SDG 9)

Table 4.13 shows the effects of financial inclusion on the industry, innovation, and infrastructure. Coefficients from models 1-4 are insignificant, although the latter 3 are positive. Hence, $H6_a$ is not rejected. The findings indicate that financial inclusion does not relate to industry, innovation, and infrastructure. While it is widely known that financial inclusion fosters technological innovation and industrial development, the insignificant impact could be since most sample countries are developing or least developed countries (50 samples) where their access to finance is minimal and where the innovation and development have yet made a difference. As a result, the contribution of financial inclusion to innovation and development is negligible.

Allard and Williams (2020) made a similar assertion that the effects of financial inclusion on innovation are contingent on the development of a country. Lashitew et al. (2019) also revealed that demand-related factors of financial inclusion have an unobvious effect on mobile money adoption in Kenya. They posited that greater adoption of mobile money innovations is mainly driven by a supportive regulatory environment than a latent demand for financial access alone. Hence, besides focusing on finance delivery, a conducive regulatory climate accompanied by good governance is important to reduce market uncertainties in promoting innovation and industry development.

Table 4.13 Impacts of financial inclusion on industry, innovation, and infrastructure (SDG 8)

VARIABLES	FEM			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)
Constant	45.21***	39.94***	43.11***	42.26***
	(8.270)	(9.044)	(8.674)	(9.118)
INF	-0.10	-0.11	-0.11	-0.12
	(0.127)	(0.126)	(0.128)	(0.128)
INT	-1.04**	-0.99**	-1.06**	-1.05**
	(0.402)	(0.405)	(0.404)	(0.402)
POP	-5.84**	-5.13**	-5.54**	-5.50**
	(2.482)	(2.492)	(2.472)	(2.467)
TRADE	0.07	0.07	0.06	0.06
	(0.0890)	(0.0886)	(0.0886)	(0.0886)
FII	-6.59	15.19	5.49	10.64
	(15.63)	(16.58)	(20.18)	(26.65)
Poolability F-test	58.32***	49.08***	43.55***	40.34***
BP LM test	99.82***	98.88***	95.60***	98.80***
Hausman test	38.65***	29.09***	27.77***	18.64***
Adjusted R-squared	0.19	0.20	0.19	0.19
F-statistic	3.63***	3.80***	3.61***	3.63***
Wald chi2(8)	37.89***	58.55***	66.07***	84.56***
Prob > chi2				
Number of obs	234	234	234	234

Notes:
1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.7 Financial Inclusion and Reducing Inequality (SDG 10)

Moving to Table 4.14, the coefficients from most models, *i.e.* models 1, 2, and 4. are insignificant though positive. The findings indicate that financial inclusion does not reduce inequality. Hence, it does not reject H7$_a$. This contradicts the established literature (Dabla-Norris et al., 2015; De Haan & Sturm, 2017; Omar & Inab, 2020) posited that financial inclusion plays a crucial role in reducing inequality. Unlike these studies using only a group of countries with similar characteristics or developmental stages, this study used a mixed sample of countries. Hence, a possible reason for the difference is that the sample countries used for the study include both developing and developed countries, likely depleting the reducing effects of financial inclusion on inequality among one another. This study takes a step further to reduce the sample countries into 2 groups - developing and developed countries. As shown in Table A1 in Appendix, the results using developing countries only (50 samples) show a significant positive association between financial inclusion and reducing inequality.

These findings corroborated the results from García-Herrero and Turégano (2015), who validated the Kuznets curve hypothesis by demonstrating that the inequality-reducing power of financial inclusion relies on a country's developmental level. Another study by Ouechtati (2020) also found that high bank penetration rates and credit facilitate access to financial services for vulnerable groups and reduce overall income inequality in 53 sample countries between 2004 and 2017. Besides, the positive coefficients increase with their

significance unchanged when life and non-life insurance are taken into account, indicative that insurance complements the banking services by helping individuals and households to withstand shocks and build their resilience.

Table 4.14 Impacts of financial inclusion on reducing inequality (SDG 10)

VARIABLES	FEM	REM	FEM	FEM
	(1)	(2)	(3)	(4)
	B	BL	BNL	BLNL
	(Banking)	(Banking + Life insurance)	(Banking + Non-life insurance)	(Banking + Life + Non-life insurance)
Constant	29.97	62.55***	21.13	25.16
	(27.60)	(11.60)	(28.35)	(30.44)
INF	-0.55	-0.13	-0.59	-0.54
	(0.562)	(0.534)	(0.556)	(0.565)
INT	-0.86	-0.81	-0.95	-0.77
	(1.352)	(0.650)	(1.341)	(1.358)
POP	24.96**	-5.39	23.38**	23.75**
	(10.57)	(3.711)	(10.29)	(10.52)
TRADE	-0.13	0.04	-0.09	-0.09
	(0.298)	(0.0792)	(0.293)	(0.298)
FII	72.52	-27.95	122.4*	99.55
	(52.25)	(30.53)	(67.05)	(89.72)
Poolability F-test	15.93***	15.52***	16.55***	16.01***
BP LM test	67.44***	68.07***	67.86***	68.03***
Hausman test	11.10**	8.22	12.48**	9.90*
Adjusted R-squared	0.08	0.01	0.10	0.08
F-statistic	1.35	0.98	1.65	1.20
Wald chi2(8)	5.48	6.41	5.50	5.37
Prob > chi2				
Number of obs	234	234	234	234

Notes:
1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.3.8 Financial Inclusion and Sustainable Development (SDG index)

The estimated results have exhibited the main channels - ending hunger (SDG2), reducing gender inequality (SDG5), and promoting economic growth (SDG8) - how financial inclusion relates to sustainable development. This finding is similar to Kuada's (2019) results, which found that inclusive financial services' impact on some of the SDGs is direct (*e.g.* SDGs 1, 2, 5, and 8). However, the impacts on other SDGs are not immediately evident. Although there are missing linkages between financial inclusion and certain SDGs, *i.e.* SDG 1,3,9, and 10, it is explainable as (1) evidence from the literature, (2) different variables used between this study and previous studies, and (3) there could be some mediating variables unconsidered given that sustainable development is not only directly underpinned by financial inclusion alone, but its influence could be exerted through other indirect channels.

Understanding that sustainable development is a multifaceted concept that has drawn on several disciplines, including economics, ecology, ethics, and sociology, looking at these SDGs alone is insufficient to understand the aggregated effects of financial inclusion on sustainable development. Hence, this study computed an SDG index incorporating the indicators from the 7 finance-related SDGs drawn from existing theories and empirical studies. Then, the estimation results based on the SDG index are reported in Table 4.16 and interpreted accordingly.

4.3.8.1 Finance-Related Sustainable Development Goals (SDG) Index

To analyse the links between the FI indices registered by 76 countries and SDG index scores, this study used the official data available from 2017 to 2020. Thus, the individual performance of the analysed countries was quantified through individual scores from the SDG Index and Dashboards Report published by the UN Sustainable Development Solutions Network.

The country-specific SDG index considers all relevant indicators 7 finance-related SDGs, then aggregates the indicators into a composite index and presents in Table 4.15 to allow assessment between countries. An SDG index not only draws attention to the finance-related SDGs but can also be used as a guide to national policies and strategies to achieve sustainable development.

The SDG score illustrates the current position of a country from the worst (0) to the best (100) outcome. For example, in Table 4.15, Belgium's overall Index score (89.5) in 2020 suggests that the country is 89.5% on its way to the best possible outcome for the 7 SDGs.

Table 4.15 Aggregated 7 finance-related SDG index from 2017 to 2020

Country	2017		2018		2019		2020	
	SDG Index	Rank	SDG Index	Rank	SDG Index	Rank	SDG Index	Rank
Albania	67.8	42	65.3	48	66.9	45	67.2	45
Algeria	55.4	62	68.0	40	71.5	32	73.5	33
Argentina	71.4	32	68.3	39	69.2	40	71.1	39
Australia	84.1	11	85.2	13	83.3	13	85.2	13

Austria	86.0	8	87.2	10	87.4	8	89.3	8
Azerbaijan	70.5	37	70.1	35	71.1	34	70.4	40
Barbados	68.4	40	66.3	44	64.3	49	62.2	61
Belgium	87.6	6	87.9	8	87.1	9	89.5	7
Bolivia	52.8	67	61.5	58	63.3	53	65.4	51
Brazil	64.0	47	65.5	47	65.2	47	67.6	44
Bulgaria	69.4	39	71.5	33	70.0	39	71.7	37
Cambodia	60.9	55	61.7	57	63.6	51	63.6	57
Chile	68.4	41	69.7	36	71.3	33	74.8	32
China	71.7	31	75.2	25	79.8	17	81.4	19
Colombia	58.1	60	59.4	62	61.4	59	63.0	58
Costa Rica	52.2	68	67.1	43	67.1	44	69.0	41
Croatia	76.9	23	76.5	22	76.3	24	80.0	23
Czech Republic	84.9	9	84.0	15	84.5	12	87.1	12
Denmark	89.3	3	91.4	2	90.1	2	92.0	1
Dominican Republic	60.1	58	59.9	60	63.0	55	64.3	54
Ecuador	61.9	52	61.7	56	63.4	52	66.6	47
Egypt	54.1	63	59.9	61	61.6	58	64.4	53
El Salvador	60.1	57	58.8	65	60.1	61	63.0	59
Estonia	80.4	16	80.6	17	80.1	16	83.8	16
Fiji	70.9	35	75.1	27	71.0	35	66.5	48
Finland	87.6	5	88.5	6	88.2	4	90.0	5
Georgia	63.8	48	64.6	51	63.2	54	65.5	50
Greece	74.6	25	71.5	34	71.7	31	75.5	28
Guatemala	53.1	66	51.4	70	52.3	65	53.5	65
Guyana	61.7	53	58.1	66	50.3	68	52.7	67
Honduras	51.7	69	53.0	67	51.0	66	51.9	69
Hungary	79.1	20	77.6	21	78.1	21	81.2	20
Iceland	86.1	7	90.2	3	87.8	6	88.4	10
Indonesia	61.7	54	59.3	64	60.7	60	62.5	60
Ireland	84.3	10	87.3	9	85.7	10	88.7	9
Italy	80.2	17	79.8	18	80.9	15	83.9	15
Jordan	66.7	44	64.5	52	63.8	50	66.4	49
Kazakhstan	74.1	28	69.3	37	70.2	38	71.3	38
Kenya	49.6	70	51.5	69	46.8	72	52.9	66
Korea	74.4	26	88.4	7	88.8	3	91.3	2
Latvia	76.7	24	77.8	20	78.3	20	79.6	24
Lithuania	78.3	21	75.7	24	73.7	27	76.9	26
Luxembourg	82.5	13	86.3	11	83.0	14	84.9	14
Malawi	32.5	74	36.8	74	37.7	74	39.0	74
Malaysia	70.9	34	72.8	31	70.8	36	76.1	27
Mexico	65.8	46	62.0	55	62.9	56	66.7	46
Moldova	70.6	36	73.2	29	72.0	30	72.5	36
Mozambique	31.7	75	34.0	75	34.8	75	34.4	75

Namibia	41.8	73	44.5	73	45.0	73	46.0	73
Netherlands	89.3	4	89.7	4	87.9	5	90.2	4
Nicaragua	53.3	65	59.3	63	59.6	62	57.4	64
North Macedonia	66.8	43	67.5	42	66.1	46	68.9	42
Norway	89.8	2	89.3	5	87.5	7	89.8	6
Pakistan	53.5	64	49.9	71	49.8	69	50.5	71
Panama	62.4	50	62.6	54	61.8	57	64.1	56
Paraguay	57.3	61	63.8	53	65.1	48	65.3	52
Peru	62.7	49	64.7	50	67.3	43	68.4	43
Philippines	60.4	56	60.3	59	59.6	63	61.0	62
Poland	79.6	19	75.2	26	76.6	23	80.2	22
Portugal	77.3	22	76.2	23	76.9	22	80.3	21
Romania	74.4	27	65.9	46	67.6	42	73.0	34
Saudi Arabia	62.2	51	71.9	32	50.7	67	52.3	68
Serbia	72.0	30	73.1	30	75.4	25	78.0	25
Singapore	82.1	14	85.7	12	74.6	26	75.2	29
Slovak Republic	80.6	15	80.7	16	79.0	19	81.8	18
Slovenia	83.4	12	85.1	14	85.6	11	88.1	11
South Africa	48.0	72	49.3	72	47.9	70	51.1	70
Spain	80.0	18	79.2	19	79.6	18	82.2	17
Sweden	91.1	1	91.5	1	90.7	1	91.0	3
Thailand	71.0	33	69.1	38	72.5	29	75.2	30
Trinidad and Tobago	59.6	59	64.8	49	59.6	64	59.7	63
Turkey	69.6	38	67.9	41	70.6	37	72.5	35
Uganda	49.5	71	52.1	68	46.8	71	48.0	72
Ukraine	73.8	29	73.5	28	72.8	28	75.0	31
Uzbekistan	66.3	45	66.0	45	68.5	41	64.1	55

Source: Author's own computation

From 2017 to 2020, the countries that topped the SDG index are mainly Nordic countries, namely Sweden, Norway, Denmark, Iceland, Finland, and Netherlands, except for Korea. Korea is the only Asian country with a remarkable increase in its SDG index, with its ranking leapfrogging from 28th in 2015 to 2nd in 2020. The dramatic changes show that Korea is progressively heading towards the 2030 Agenda outlined by the United Nations General Assembly and renowned by Oxfam and Development Finance International (DFI) as the country that made the most positive policy to reduce inequality and

promote better well-being. Most of the countries in the top 20 are OECD countries, showing evidence that the concerted efforts by the countries in securing basic economic needs and reducing deprivation have come fruitful. As Asia's premier regional hub, Singapore dropped significantly in its SDG index and ranked 29th in 2020 compared to 14th in 2017. This implies that rapid development and robust economic growth might not necessarily translate into sustainability as it requires an economy's integrated and interlinked social and economic aspects to be coordinated comprehensively (Basiago, 1998). A rich country can be highly unequal in terms of its distribution.

Developing countries like China, Malaysia, and Thailand have significantly improved their SDG indices. For example, China's SDG index increases steadily over time, and its ranking bounces from 31st to 19th, whereas Malaysia is from 34th to 27th and Thailand from 33rd to 30th. Through an innovative approach, China actively adopts pressing domestic policy chief by poverty alleviation and an unveiling urbanisation plan to moderate inequality. The Belt and Road Initiative (BRI) led by China has benefited itself and substantially brought economic gains by providing infrastructure support and improved social well-being to its counterparts in the region (Chatzky & McBride, 2020).

Meanwhile, low-income countries like Uganda, Ukraine, and Uzbekistan scored lower on the SDG index. This is primarily due to SDGs placing great weight lowering poverty and enhancing basic infrastructure. Lower-income countries generally record lower economic growth and

infrastructure development. Moreover, poverty in these countries further stimulates inequality within the society, given that women tend to experience higher poverty rates than men and have their rights unprotected.

Overall, the sample countries are progressing toward the SDGs. A total of 59 countries increased their SDG index scores over the period, and the remaining 17 countries saw a slight decline. It shows that many countries have taken the initiative to adopt and implement SDGs in their developmental policies aligning with their global commitments. In particular, Algeria, Bolivia, Costa Rica, Egypt, and Korea have recorded a proliferation in SDG index scores of more than 10. The SDG index underlines that despite achieving high percentages, it still requires collaborative efforts by all countries to close the remaining gaps.

4.3.8.2 Financial Inclusion and Sustainable Development (Based on SDG index)

Table 4.16 illustrates the relationship between sustainable development, financial inclusion, and other independent variables based on 3 sets of panel data models, namely pooled ordinary least square (POLS), random-effect (RE), and fixed-effect (FE) models. Of the 3 sets of panel models, the first model refers to financial inclusion using banking indicators (B), the second model uses banking and life-insurance indicators (BL), the third model uses banking and non-life insurance indicators (BNL), and the last model using banking, life, and non-life insurance indicators (BLNL).

R-squared represents the independent variables which describe the percentage of variables for pooled ordinary least square (POLS) and fixed-effect (FE) regressions. Alternatively, the Wald chi2 (P>chi2 less than 0.05) indicates the fitness of the random-effect (RE) regression (Alhassan & Biekpe, 2015). The poolability F-test in Table 4.16 shows that the FE model is preferred over the POLS model for B, BL, BNL, and BLNL. On the other hand, the Breusch-Pagan LM test suggests that the RE model is preferred over the POLS model. The Hausman tests further indicate that the RE models are best for B, BL, BNL, and BLNL. Hence, all results will be interpreted using RE models: Models 9, 10, 11, and 12.

In Model 9, three variables significantly influence sustainable development: the FI index (banking indicators), inflation, and population growth. Financial inclusion has a positive association with sustainable development, as supported by Churchill and Marisetty (2020) as well as Niaz (2021). Financial inclusion contributes to the economic development of impoverished people and improves their income levels and spending on necessities, education, and medication. Meanwhile, financial inclusion is also a complementary tool to social stability as it reduces income inequality (Neaime & Gaysset, 2018).

In the same vein, a study by Dupas and Robinson (2013) stated financial inclusion significantly impacts employment, consumption, and production. It is important to note that while Niaz (2021) found the potential for financial inclusion to promote economic conditions more prominently in urban areas than

in rural areas, Kim et al. (2018) revealed that financial inclusion is vital for growth, especially in remote and rural areas. Uneven distribution of financial resources, the outreach of financial branches, and funds utilisation in different regions are the possible reasons underlying the spatial effects.

Hence, $H8_a$ is rejected. It must be emphasised that the relationship between financial inclusion and sustainable development is not directly comparable to these studies as their measures of sustainable development vary. That is, the previous studies used only a measure of a certain aspect of the SDGs, whereas this study used an aggregated measure proxied by the SDG index. This study presents the first attempt to use an aggregated measure of finance-related SDGs. Although not directly comparable to the previous studies, the results of previous studies provide a reference that is indicative of the potential linkage between financial inclusion and different aspects of sustainable development.

As observed in Table 4.16, the interest rate is negatively and significantly related to sustainable development only at 10%. This is possible because raising interest rates increases borrowing costs, reduces disposable income, and limits spending in consumption. The tendency for people to invest their money in more lucrative investment opportunities is also reduced compared to depositing their money in the bank. As a result of lower credit, the investment in production and infrastructure supports sustainable development.

The results, however, contradict the findings of Sujianto et al. (2020), who found that economic growth responds positively to soaring real interest

rates. A higher interest rate is indeed expected to discourage borrowers from investing, the case in Indonesia is different as the high-interest rate does not deter people. Therefore, the borrowers would be willing to accept the limited options at whatever rate the banks offer interest rates. The contradictory findings suggest that the impact of interest rates on sustainable development is likely influenced by financial inclusion.

The results recommend that inflation negatively affects sustainable development by hampering economic growth. The possible reasons underlying this relationship include that inflation reduces business investment by lowering real interest rates and savings. Besides, inflation increases the cost of resources in production and decreases the efficiency with which productive factors are put to use. The finding is substantiated by Barro (2013) who suggests the new growth theory also showed a negative relationship between inflation and sustainable growth, resulting from the possibility that inflation tends to reduce the rate of technical change. Similarly, Lyke and Ho (2019) documented that inflation may hinder long-term and short-term sustainable development, in line with the Friedman-Ball hypothesis. According to Friedman (1977), higher inflation levels are associated with higher inflation uncertainty as it influences the effectiveness and accuracy of the price mechanism, slowing economic activities and development.

The results further show a negative relationship between population growth and sustainable development, consistent with the findings of Güney (2017). This relationship echoes the findings of the World Bank, where

sustained and rapid population exacerbates the challenge of ensuring that social and economic development is sustainable and inclusive. This is because rapid population growth makes it more difficult for low-income and lower-middle-income countries, which constitute the majority of the sample countries, to afford higher public expenditures on a per capita basis, such as poverty reduction, maintaining a healthcare system, ensuring affordable education, and offering of other essential services.

As part of the SDGs, sustainable food security is crucial. An increase in population size accompanied by a shrinking agricultural land and strain on natural resources adds to the challenges of sustainable food security. Another study by Cleland and Machiyama (2016) also found that economic growth in sub-Saharan Africa (SSA) was buoyant due to its fast-growing population and economic pressure. Although commonly, population and economic growth are positively related, it should be understood in terms of the financial peculiarities of each country, where more individuals will suffer from financial exclusion when the percentage of financial inclusion remains but the population size increases.

Conversely, the coefficient of trade openness is positive but not statistically significant in Model 9, suggesting that trade openness does not influence sustainable development. Inspired by Rodrik and Rodríguez (2000), who revealed the controversy between trade and development, a recent study was carried out by Ulaşan (2015) and stipulated the absence of a clear-cut relationship between trade and development. However, such a relationship is

contingent on many external and country-specific factors. The insignificant influence of trade openness on sustainable development could be that although it is known to foster economic growth, trade openness tends to benefit the relative income shares of the very poor disproportionately, but the benefits are not shared by all the poor in most developing economies (Dorn et al., 2022). Besides, they further revealed that trade openness increases income inequality in most advanced economies, driven by outliers. Hence, any additional trade openness might contribute to certain aspects of sustainable development but is unlikely to imply a significant impact when all aspects of SDGs are considered.

In Model 10, the FI index is computed using banking and life insurance indicators. Like Model 9, the FI index (banking indicators), inflation, and population growth are the independent variables that significantly influence sustainable development, except for interest rates. Hence, governments and policymakers should be more cautious in formulating population and inflation control policies. The causality between the variables is mainly unchanged, only that the estimated coefficient of the FI index slightly increases from 37.72 to 37.83. In other words, compared to the FI index using banking indicators alone, life insurance adds to the importance of financial inclusion in upholding sustainable development. This is because life insurance in the form of microinsurance provides an instrumental tool to insulate the living conditions of households from unpredictable shocks, where their income-generating capacity and savings are exhausted. As a result, individuals or households are prevented from falling into poverty. Life insurance can be seen as a complement to the banking system as a way to include the impoverished. Additionally, this

suggests that a prospective substitution effect between life insurance and banking exists in the BRI countries, as Lee et al. (2020) showed.

In Model 11, non-life insurance is incorporated into the FI index. While producing similar results to Models 9 and 10, the estimated coefficients of inflation, interest rate, and population growth slightly decrease, whereas the estimated coefficient for the FI index increases from 37.72 to 43.21. This signifies that non-life insurance has a more significant and positive impact on sustainable development, given that it has long accounted for a bigger portion of the global insurance market than life insurance. The distribution of global gross premiums of life and non-life insurance until 2019 is 45% and 55%, respectively. As a risk-reducing instrument, non-life insurance protects non-living assets and provides a proper system to facilitate the monetary flow and investments that enhance the financial market and economic growth. Hence, non-life insurance is one of the financial services that must not be neglected to realise the gains from financial inclusion to achieve SDGs.

With an FI index using banking-life-and-non-life-insurance, Model 12 illustrates a significant relationship between financial inclusion, inflation, population growth, and sustainable development. The magnitude of the positive effects of financial inclusion is magnified, whereas the negative impacts of inflation and population growth on sustainable development are diminished. The findings affirm the insurance industry's merits and potential contribution to sustainable development. Nonetheless, life insurance presents a greater opportunity for fostering greater financial inclusion.

Table 4.16 Panel Regression Models (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) based on the SDG index

FI Indicators	POLS				FE				RE			
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)	(5) B (Banking)	(6) BL (Banking + Life insurance)	(7) BNL (Banking + Non-life insurance)	(8) BLNL (Banking + Life + Non-life insurance)	(9) B (Banking)	(10) BL (Banking + Life insurance)	(11) BNL (Banking + Non-life insurance)	(12) BLNL (Banking + Life + Non-life insurance)
Constant	63.96***	65.21***	63.09***	64.41***	68.30***	67.04***	66.43***	65.75***	63.39***	63.71***	62.47***	63.15***
	(3.071)	(2.941)	(2.953)	(2.903)	(8.783)	(9.479)	(9.176)	(9.759)	(4.107)	(4.104)	(4.029)	(4.028)
INF	-0.64**	-0.64**	-0.59**	-0.63**	-0.26*	-0.23*	-0.27*	-0.26*	-0.32**	-0.28**	-0.32**	-0.31**
	(0.248)	(0.248)	(0.240)	(0.242)	(0.139)	(0.139)	(0.139)	(0.140)	(0.130)	(0.132)	(0.130)	(0.130)
INT	-0.24	-0.20	-0.19	-0.18	-0.97**	-0.84*	-1.00**	-0.94**	-0.43*	-0.36	-0.40*	-0.37
	(0.158)	(0.158)	(0.153)	(0.155)	(0.440)	(0.447)	(0.441)	(0.441)	(0.235)	(0.236)	(0.229)	(0.232)
POP	-3.92***	-4.06***	-3.76***	-3.85***	-1.27	-1.23	-1.36	-1.51	-3.02**	-3.01**	-2.94**	-3.05**
	(0.870)	(0.871)	(0.844)	(0.854)	(2.697)	(2.740)	(2.683)	(2.692)	(1.286)	(1.289)	(1.257)	(1.267)
TRADE	0.01	0.01	0.01	0.01	-0.01	0.01	-0.01	-0.00	0.01	0.010	0.01	0.01
	(0.0177)	(0.0180)	(0.0171)	(0.0174)	(0.0906)	(0.0911)	(0.0903)	(0.0908)	(0.0285)	(0.0286)	(0.0277)	(0.0281)
FII	40.67***	40.86***	43.29***	42.42***	28.87*	25.49	38.09*	43.94	37.72***	37.83***	43.21***	44.75***
	(8.144)	(8.203)	(7.419)	(7.705)	(16.91)	(18.06)	(21.79)	(29.18)	(10.46)	(10.75)	(10.60)	(11.61)
Poolability F-test	23.39**	23.13***	21.94***	22.30***								
	87.69***	86.12***	86.11***	86.23***								
BP LM test									4.07	4.11	3.77	3.45
Hausman test	0.44	0.44	0.47	0.46	0.14	0.14	0.15	0.14				
Adjusted R-squared	0.41	0.41	0.45	0.43								
F-statistic	19.05***	19.01***	21.75***	20.64***	2.77***	2.56***	2.81***	2.63***				
Wald chi2(8) Prob > chi2									39.24***	38.10***	43.98***	41.78***

| Number of obs | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 | 234 |

Note: ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

4.4 Robustness Check

The robustness checks are presented to examine the sensitivity of the results to alternative index computation methods and datasets. The first robustness check develops an FI index via the PCA method to find the appropriate weights (parametric method) and check whether different computation method affects the index. Then, the countries are ranked according to their financial inclusion level and compared with the ones using the Euclidean distance method. The second set of robustness checks involved using lagged SDGs index (t-1) data to replace the SDGs index data (t) in the estimations, given the potential lagged effects of financial inclusion on sustainable development. A robustness check is necessary to ensure reliable statistical inference can be drawn from the models.

The FI indices computed from Table 4.5 are consistent with results from the robustness check using PCA. That is, the banking sectors constitute a bigger proportion of the FI index, whereas insurance contributes less significantly to the FI index. Meanwhile, the robustness check using the lagged data of the FI index confirms the results from 4.16. It is observed that the FI indices are significant with the same signs of coefficients. Other independent variables show the same signs of coefficients. Hence, it is appropriate to conclude that all the results and discussions in sections 4.1 and 4.3 are valid.

4.4.1 Computation of Financial Inclusion (FI) Index using PCA

4.4.1.1 First-stage PCA results

Through the PCA method, it calculated each sub-index's eigenvalues and estimated the latent variables: Availability, Accessibility, and Usage. The highest eigenvalue of the components retains more standardised variance among others, and an eigenvalue greater than 1 is considered for the analysis (Kaiser, 1960).

Table 4.17 summarises the three principal components and their eigenvalues (variances of these components). It is seen that the eigenvalues of the principal components (PCs) for all three dimensions in the corresponding order are: 3.01; 0.94; 0.60; 0.27; 0.16 (Availability); 1.22; 0.77 (Accessibility) and 2.30; 1.01; 0.45; 0.21 (Usage). For Availability, only *deposit.acc* (pc1) has a variance of 3.01 and explains 60% of the total variance, whereas the fourth and fifth components are relatively smaller and explain the residual variance of only 8%. This suggests that pc1 is the most important component in the financial inclusion index, while the rest are less significant.

Similarly, for Access, only *ATM* has a variance of more than 1 and explains 61% of the total variance. Meanwhile, the *ins.corp* is also strong and explains more than one-third of the variance.

For Usage, *deposit* and *loan* have an eigenvalue greater than 1 and explain 57% and 25% of the variance, respectively. Although *life.spending* and *n.life.spending* have a smaller variance of 11% and 5%, they are generally greater than the variance demonstrated by insurance indicators in Availability.

Table 4.17 Principal Components Estimates for Subindices for banking-life-and-non-life-insurance FI index (FI_{BLNL})

Component	Eigenvalue	Difference	Proportion	Cumulative
(1) Availability				
deposit.acc	3.01493	2.07145	0.6030	0.6030
loan.acc	.943473	.343122	0.1887	0.7917
c.cards	.600351	.321868	0.1201	0.9117
life.density	.278483	.321868	0.0557	0.9674
n.life.density	.162768		0.0326	1.0000
(2) Accessibility				
ATM	1.22369	.447381	0.6118	0.6118
ins.corp	.77631		0.3882	1.0000
(3) Usage				
deposit	2.30852	1.29206	0.5771	0.5771
loan	1.01645	.55702	0.2541	0.8312
life.spending	.459435	.243839	0.1149	0.9461
n.life.spending	.215596		0.0539	1.0000

Source: Author's own computation

4.4.1.2 Second-stage PCA results

In the second stage, the PCA method is used on the three sub-indices to calculate their weights in the overall FI index by applying the same procedure described in the first stage. Table 4.18 shows the results of PC estimates for the composite FI index. The eigenvalues of the three PCs respectively are 1.94, 0.71, and 0.33. This shows that only the first component has an eigenvalue greater than 1, so it is taken to find the weights assigned to the PCs.

In relation to the PC structure, it is observed that Availability accounts for 65% of the total variation of the data and is contributed by all three dimensions. This indicates that the three dimensions measuring the same latent structure are interpreted as the FI level. The result shows that the financial inclusion in the sample countries is mainly driven by the banking sector, whereas the life and non-life insurance market have a smaller contribution. Although having less significance due to a smaller market volume and value, the positive effect of insurance on financial inclusion indicate that it plays a role in augmenting the financial inclusion of a given country. The computation of the FI index and its analysis dissects the individual effects of the roles of life and non-life insurance inclusive financial inclusion in each country, whereas PCA analysis reaffirms the validity of the FI index. Next, the Kaiser–Meyer–Olkin (KMO) measure value of 0.61 shows that the result satisfies KMO > 0.5 (Hair et al., 1998). Therefore, the analysis factor is consistent with the data.

Table 4.18 Principal components estimates for the overall FI index

Component	Eigenvalue	Difference	Proportion	Cumulative
Availability	1.94992	1.2354	0.6500	0.6500
Access	.714514	.378945	0.2382	0.8881
Usage	.335569		0.1119	1.0000

Source: Author's own computation

4.4.2 Lagged Panel Model

Considering the potential lagged effects of financial inclusion on sustainable development and to ensure the robustness of the findings using static panel models in studying the relationship between financial inclusion and sustainable development, it estimated equations (4) to (7) by replacing the FI indices with lagged FI indices from 2017 to 2020. Table 4.19 displays the lagged impacts of financial inclusion on sustainable development. Likewise, 4 alternative regressions for the POLS based on FI indices using 4 sets of indicators are given. The poolability F-test in Table 4.19 shows that the FE model is preferred over the POLS model for B, BL, BNL, and BLNL. Meanwhile, the Breusch-Pagan LM test suggests that all models prefer the RE model over the POLS model. The Hausman tests indicate that the RE models are best for B, BNL, and BLNL, whereas the FE model is best for BL. Hence, the results will be interpreted using RE models: Models 9, 11, and 12 and FE model: Model 6.

The results show a significant lagged effect of financial inclusion on sustainable development. Among the variables of interest in financial inclusion, three proxies have the same signs of coefficients and significance, except in Model 6, where the coefficient turns negative and insignificant. For instance, the banking sector, banking-and-non-life-insurance, as well as banking-life-and-non-life-insurance, stayed as a positive influence on sustainable development, only at a smaller magnitude. The change in coefficients could be because most of the FI indices illustrate steady growth over the years. Hence the coefficient became smaller when lagged data was used. Besides, inflation

and population growth remain negative when lagged data of FI indices are used.

The outcome further confirmed the findings of this study.

Table 4.19 Robustness check on estimation results using lagged data of FI index (2016 – 2019)

FI Indicators		POLS					FE				RE		
	(1) B (Banking)	(2) BL (Banking + Life insurance)	(3) BNL (Banking + Non-life insurance)	(4) BLNL (Banking + Life + Non-life insurance)	(5) B (Banking)	(6) BL (Banking + Life insurance)	(7) BNL (Banking + Non-life insurance)	(8) BLNL (Banking + Life + Non-life insurance)	(9) B (Banking)	(10) BL (Banking + Life insurance)	(11) BNL (Banking + Non-life insurance)	(12) BLNL (Banking + Life + Non-life insurance)
Constant	65.58***	66.92***	64.88***	66.29***	69.64***	74.49***	71.65***	70.25***	66.69***	69.28***	66.68***	66.02***
	(2.575)	(2.542)	(2.494)	(2.452)	(2.919)	(3.438)	(3.290)	(3.436)	(2.806)	(3.077)	(2.900)	(2.913)
INF	-0.54**	-0.56**	-0.51**	-0.56**	-0.02	-0.01	-0.01	-0.02	-0.05	-0.04	-0.05	-0.05
	(0.228)	(0.232)	(0.221)	(0.223)	(0.0711)	(0.0737)	(0.0734)	(0.0729)	(0.0704)	(0.0745)	(0.0725)	(0.0715)
INT	-0.26*	-0.20	-0.21	-0.19	-0.20	-0.29	-0.25	-0.23	-0.20	-0.22	-0.22	-0.20
	(0.141)	(0.144)	(0.138)	(0.140)	(0.183)	(0.197)	(0.189)	(0.188)	(0.158)	(0.169)	(0.160)	(0.159)
POP	-4.10***	-4.17***	-3.92***	-4.00***	-2.29**	-2.74**	-2.75**	-2.46**	-3.11**	-3.29***	-3.43***	-3.14***
	(0.774)	(0.786)	(0.753)	(0.764)	(1.146)	(1.189)	(1.171)	(1.174)	(0.889)	(0.933)	(0.893)	(0.892)
TRADE	-0.00	-0.01	-0.00	-0.00	-0.05*	-0.04*	-0.04	-0.04*	-0.01	-0.00	-0.01	-0.01
	(0.015)	(0.015)	(0.014)	(0.015)	(0.028)	(0.029)	(0.029)	(0.028)	(0.020)	(0.020)	(0.000)	(0.020)
FII	44.19***	42.65***	45.83***	44.40***	21.22***	-0.02	13.49	22.80*	27.87***	13.50*	30.35***	37.86***
	(7.136)	(7.474)	(6.545)	(6.745)	(7.079)	(7.975)	(10.16)	(12.77)	(6.353)	(7.019)	(7.955)	(9.098)
Poolability	82.83***	79.05***	73.66***	76.80***								
F-test	187.02***	179.30***	184.48***	184.84***								
BP LM test									7.54	16.45***	7.22	0.10
Hausman test	0.43	0.41	0.46	0.44	0.26	0.07	0.24	0.29				
R-squared												
Adjusted R-squared	0.41	0.39	0.44	0.43								
F-statistic	24.09***	22.44***	27.12**	25.50***	5.41***	3.35***	3.76***	4.08***				
Wald chi2(8)									45.86***	28.13***	40.80***	43.87***
Prob > chi2									0.000	0.000	0.000	0.000
Number of	312	312	312	312	312	312	312	312	312	312	312	312

obs

Note: ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

Source: Author's own computation

4.5 Summary

The main highlights of Chapter 4 are summarised in Table 4.20.

Table 4.20 Summary of Chapter 4

Computation of Financial Inclusion Index (Objective 1)	
Four sets of Financial Inclusion (FI) Indices - FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL} using an Inverse Euclidean Distance Robustness check on FI Index using Principal Component Analysis (PCA) – Banking sector plays a dominant role in the FI index as compared to the insurance	
Relationship between financial inclusion and sustainable development (Objective 2)	
Poverty (SDG1): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) is not significantly related to poverty reduction	**Do not reject H1$_0$** Consistent with Inoue (2018) and Gopalan and Rajan (2018)
Zero Hunger (SDG2): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) reduces hunger at 0.05 significance	**Reject H2$_0$** Consistent with Cai et al. (2021) and Peng and Xu (2019)
Health and Well-being (SDG3): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) is not significantly related to health and well-being	**Do not reject H3$_0$** Consistent with Veenhoven (2000) Inconsistent with Sakyi-Nyarko et al.(2021) and Laha and Sen (2021)
Gender Equality (SDG5): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) promotes gender equality	**Reject H4$_0$** Consistent with Robino et al. (2018) and Ohiomu and Ogbeide-Osaretin (2019)
Economic Growth (SDG8): Financial inclusion (FI_B & FI_{BLNL}) does not foster economic growth Financial inclusion (FI_{BL}, FI_{BNL}) promotes economic growth	**Reject H5$_0$** Consistent with Ward and Zurbruegg (2000) and Kugler and Ofoghi (2005) Inconsistent with Ifediora et al. (2022) and Sethi et al. (2018)

Industry, Innovation, and Infrastructure (SDG 9): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) does not significantly influence industry, innovation, and infrastructure	**Do not reject H6_0** Consistent with Allard and Williams (2020) and Lashitew et al. (2019)
Inequality (SDG10): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) does not significantly reduce inequality	**Do not reject H7_0** Consistent with García-Herrero and Turégano (2015) and Ouechtati (2020) Inconsistent with Dabla-Norris et al. (2015) and De Haan and Sturm (2017)
Sustainable Development (SDG index): Financial inclusion (FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL}) promotes sustainable development	**Reject H8_0** Consistent with Churchill and Marisetty (2020) and Niaz (2021)

Source: Author's own summarisation

CHAPTER 5

CONCLUSION

5.0 Introduction

This chapter discusses the conclusions of the study, its implications, limitations, and recommendations for future research.

5.1 Conclusions

Financial inclusion has developed as a global concern for the economic benefits it brings individuals, businesses, and sustainable growth. Financial inclusion is widely perceived as a panacea to minimise social exclusion, if not eliminate it. Despite the fast-growing and reshaping of the financial industry in today's world, nearly a quarter of the population remains without access to formal financial systems. This group of individuals and households constantly being deprived of equal access to finance come mainly from the world's developing regions. To address systemic challenges historically, governments worldwide have established national "financial inclusion" initiatives to provide their people with access to financial products and services. These countries aim to improve the financial position of their citizens and mitigate their vulnerabilities. This moment presents a window of opportunity to build financial systems that are structurally inclusive for future generations and build financial resiliency as part of the coming economic recovery.

Financial inclusion offers a comprehensive range of financial services that protect people from losing their financial security or derailing their long-term financial goals. Presently, efforts to measure financial inclusion are limited and a policy consensus has yet to arrive. The current financial inclusion index is questionable because they consider only banking-related financial services and ignore the potential contribution of other financial services. Insurance is a financial service under-emphasised by the literature among the various measures available.

The outbreak of the COVID-19 pandemic has unriddled the importance of insurance as part of the financial industry in solving global sustainability challenges in uncertain times. Given that not everyone can afford banking services due to geographical or technological constraints, insurance, especially micro-insurance, is developed by governments to fill the gap. The absence of these factors in financial inclusion measurement can not only cause the financial inclusion of a given country to be inaccurately presented, but it can also distort the understanding of insurance-related problems in promoting financial inclusivity.

Hence, the first objective of this study is to compute an FI index that incorporates the role of life and non-life insurance and compares them against the banking-only financial inclusion index. The second objective of this study aims to investigate the relationship between financial inclusion and sustainable development proxied by 7 finance-related Sustainable Development Goals indicated by World Bank.

This study proposed 4 multidimensional measures of Financial Inclusion Indices (FI indices) – multidimensional measures that can be used to compare the extent of financial inclusion across different economies and monitor the economies' progress with respect to financial inclusion from the year 2015 to the year 2020 using an inverse Euclidean distance method (non-parametric). These indices are FI Index (Banking), FI Index (Banking and life insurance), FI Index (Banking and non-life insurance), and FI Index (Banking, life, and non-life insurance), where the indicators are included in each dimension separately. Then, another widely used parametric method, Principal Component Analysis (PCA), is applied to compute the financial inclusion index as a robustness check.

There are several interesting observations from this study. Generally, banking-related financial services are the main driver of financial inclusion, whereas insurance-related financial services also affect the financial inclusion level of a given country at a smaller magnitude. Unsurprisingly, high-income countries in the European region tend to have higher financial inclusion than medium-income countries from Asia and Africa, though with some exceptions. This could be because their position as international financial hubs complements their relatively more developed and inclusive banking system.

When life insurance indicators are considered, some countries leapfrogged in their financial inclusion level, whereas more countries see a decline in their financial inclusion. This is primarily due to low insurance market growth in developed economies and the dominance of banking sectors in relation to insurance sectors in developing countries. Meanwhile, non-life

insurance benefits countries in terms of their financial inclusion level more than life insurance, given a slight increase in members among the moderate financial inclusion groups compared to life insurance. Next, the FI index using banking-life-and-non-life-insurance indicators (FI_{BLNL}) show a similar result to that of the FI index using banking and non-life insurance (FI_{BNL}), implying that non-life insurance plays a more dominant role in the insurance sector as the driver of financial inclusion.

The absolute difference for each financial index documented shows that the role of insurance is emphasised in some countries but largely ignored in others, especially life insurance. Hence, more attention needs to be given to insurance to propel greater financial inclusion. Lastly, the robustness check using the PCA method for FI index computation confirms the robustness of the insurance-adjusted FI indices.

Achieving the 7 of the Sustainable Development Goals is a milestone in promoting sustainable development for all humanity. This study applied static panel models - pooled ordinary least square (POLS), fixed-effect (FE), and random-effect (RE) models to examine the relationship between financial inclusion and sustainable development. The findings revealed the main channels - ending hunger (SDG2), reducing gender inequality (SDG5), and promoting economic growth (SDG8) - how financial inclusion relates to sustainable development. Meanwhile, there is no immediate evidence that financial inclusion influences other aspects of sustainable development, *i.e.* poverty reduction (SDG1), good health and well-being (SDG3), industry, innovation,

and infrastructure (SDG9), and reducing inequality (SDG10). The missing linkage between financial inclusion and these SDGs is explainable as (1) evidence from the literature, (2) different variables used between this study and previous studies, and (3) there could be some mediating variables unconsidered given that sustainable development is not only directly underpinned by financial inclusion alone, but its influence could be exerted through other indirect channels.

Then, an SDG index is computed by aggregating the finance-related SDGs 1,2,3,5,8,9 & 10. The results from the study reveal that financial inclusion is positively related to sustainable development (based on the SDG index) for the selected countries. In ensuring that the results obtained are consistent and reliable for policy formulation, lagged data of the FI index are used on model estimation in robustness check. The findings show that the favourable effects of financial inclusion on sustainable development are magnified when life and non-life insurance are considered, implying that insurance is a financial service segment that complements the financial inclusiveness in the economy. The study further indicates that interest rates, inflation, and population growth harm sustainable development. Hence, countries must be aware of the drawbacks of their financial and population policies when cultivating the path to sustainability. Based on the results, it is concluded that greater financial inclusion improves the sustainability of the sample countries. Nonetheless, financial inclusion in most countries remains worryingly low and requires dire attention.

5.2 Implications of the Study

The study presents the financial inclusion dynamics of sample countries from the world's major regions, followed by a cross-country analysis. The outcomes provide meaningful insights into financial inclusion policies and practices. For policy implications from the sustainability perspective, governments could foster a diversity of financial institutions to cater to the growing demand. Inclusive financial systems are supposed to have more financial institutions beyond commercial banks – postal banks, microfinance institutions, credit cooperatives, and insurance providers – adopting different business models to serve distinct consumer segments. A regulatory framework that permits the entry of diverse institutions and applies proportionate supervision tailored to their respective risk levels is important to reaching consumers that are not properly captured in the formal financial system.

Besides, countries could also take advantage of the favourable opportunity of the rapid development of technologies to address worrying financial inclusion and financial development levels. Delivering the right financial service to the consumers helps to achieve core sustainable development goals. An example is the emergence of non-traditional players such as Alibaba (an e-commerce company) and Tencent (a social networking platform) to provide financial services such as e-wallet, e-insurance, and e-loan by leveraging big data and their existing customer networks to lower transaction costs and deliver financial services that cater to the needs of millions of Chinese consumers. Developing countries with low financial inclusion levels could

encourage digital wages as a substitute for a large amount of cash. A digital account also allows individuals to access to other financial services other than transactions by addressing financial barriers like geographical challenges and the absence of brick-and-mortar financial institutions. While extending the outreach of financial services, financial propaganda and education to individuals and businesses to change their perception of financial inclusion and maximise its use are equally important.

In addition, it is important to focus on the underemphasised yet potential financial services to meet specific customer needs, especially insurance, which is still largely overlooked in many countries. As part of financial inclusion, insurance promotes financial stability by reducing potential risks of frailty and poverty and realising sustainable economic growth. The National Financial Inclusion Strategy (NFIS) presents an opportunity to address the financial sector without heavy reliance on the banking industry. Only 17 out of 36 jurisdictions in the Alliance for Financial Inclusion (AFI) have included insurance as the central pillar in their NFIS due to a lack of guidance and other priorities, further highlighting the need to look into insurance to close the financial gaps.

In this regard, insurance industry players must embrace digital transformation to gain a competitive edge while delivering more customised solutions to their consumers to fulfill their diverged demands. An emerging innovative product is the customised mobile app, removing the agents and allowing simple and lower-priced insurance products to be delivered right into the hands of people. Besides, insurance companies can introduce small-ticket or

bite-sized insurance products to ensure that their consumers can get more affordable policies. A few examples of insurance are dengue insurance, backpack insurance, and mobile screen insurance, among others. Such products are tailor-made for lower-income groups whose financial knowledge is often low and ensure that they are gradually introduced to the importance of insurance while enjoying its benefits. Lastly, governments and insurance companies need to be more concentrated on creating awareness through initiatives, such as marketing campaigns, customer awareness seminars, press releases, write-ups, and direct mailing.

5.3 Limitations and Recommendations for Future Research

This study has provided critical insights into enhancing financial inclusion and its relation to sustainable development. However, due to a core focus on insurance, some areas could be overlooked. For example, pensions as part of financial services are underemphasised in this and previous studies. Pension schemes can protect the form of lump sums and pensions to dependants in the event of a member's death. As the world is suffering from the adverse impacts of the COVID-19 pandemic, the purchasing power and disposable income of the elderly are greatly reduced. Pensions are important to prevent this group of people, who are commonly deprived of other forms of financial services, from falling into poverty.

Furthermore, this study has examined the direct impacts of financial inclusion on sustainable development, but not the indirect impacts. The findings

revealed that some Sustainable Development Goals are not directly influenced by financial inclusion but by other factors such as financial education. Hence, considering the mediating role of other factors can provide this study with more supporting evidence.

5.4 Summary

The main highlights of Chapter 5 are summarised in Table 5.1.

Table 5.1: Summary of Chapter 5

Conclusions
Objective 1: **Computation of Financial Inclusion (FI) Index**
Four sets of Financial Inclusion (FI) Indices - FI_B, FI_{BL}, FI_{BNL} & FI_{BLNL} using an Inverse Euclidean Distance
Robustness check on FI Index using Principal Component Analysis (PCA) – The banking sector plays a dominant role in Financial Inclusion (FI) index compared to the insurance
Objective 2: **Financial Inclusion and Sustainable Development**
Financial inclusion significantly reduces hunger (SDG2), gender inequality (SDG5), and economic growth (SDG8)
Financial inclusion is not significantly related to poverty (SDG1), good health and well-being (SDG3), industry, innovation, and infrastructure (SDG9), and inequality (SDG10)
Financial inclusion is positively related to sustainable development (Based on the SDG index)
Implications of the study
1. Financial inclusion practices and policies
2. Emphasis on insurance
Limitations & recommendations for future research
1. Expand the financial services, *i.e.* pensions
2. Mediating role of other factors

Source: Author's own summarisation

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Table A1 Impacts of financial inclusion on reducing inequality (SDG 10) -

50 developing countries)

	REM		POLS	
	(1)	(2)	(3)	(4)
VARIABLES	B	BL	BNL	BLNL
	(Banking)	(Banking + Life insurance)	(Banking + Non-life insurance)	(Banking + Life + Non-life insurance)
Constant	36.15***	34.52***	35.43***	33.97***
	(5.117)	(4.962)	(4.970)	(4.343)
INF	0.145	0.213	0.178	0.255
	(0.278)	(0.274)	(0.275)	(0.261)
INT	0.176	0.226	0.176	0.218
	(0.210)	(0.201)	(0.203)	(0.173)
POP	0.169	0.205	0.275	0.421
	(1.173)	(1.126)	(1.134)	(0.973)
TRADE	-0.0138	-0.0113	-0.0145	-0.00891
	(0.0417)	(0.0400)	(0.0403)	(0.0346)
FII	35.83***	46.57***	44.42***	51.93***
	(12.74)	(13.46)	(14.24)	(13.17)
Poolability F-test	1.78***	1.64***	1.67***	1.61
BP LM test	1.53	1.07	0.87***	0.51
Hausman test	9.58	8.12	9.82	9.98
Adjusted R-squared	0.0094	0.0284	0.0941	0.1115
F-statistic	1.94	1.90	1.78	1.78
Wald chi2(8)	9.18	13.39***	11.13**	13.05**
Prob > chi2				

Notes:

1. Model 1 is estimated using banking indicators only (FI_B), model 2 is estimated using banking-and-life-insurance indicators (FI_{BL}), model 3 is estimated using banking-and-non-life-insurance indicators (FI_{BNL}), and model 4 is estimated using banking-life-and-non-life-insurance indicators (FI_{BLNL}).
2. ***, **, and * denote 1%, 5%, and 10% significant levels respectively.

APPENDIX B – Publication (Journal Articles under Review / Accepted)

Journal Article Accepted

1. The role of financial inclusion in achieving finance-related sustainable development goals (SDGs): a cross-country analysis (Economic Research-Ekonomska Istraživanja, Routledge, Publication date: 02 June 2023)

Journal Articles under Review

1. How Do Life And Non-Life Insurance Affect Financial Inclusion? New Empirical Evidence From A Cross-Country Analysis (Bulletin of Monetary Economics and Banking, Bank Indonesia Institute – Bank Indonesia, Revision date: 1 May 2023)