Financial Inclusion and Vulnerability in a Developing Nation: Role of Financial Literacy, Digital Finance, and Socioeconomics Spacing

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Abstract

Financial inclusion is a crucial factor in promoting economic growth and reducing income disparities, particularly in developing countries. This study explores the determinants of financial inclusion, focusing on the roles of financial literacy, digital finance, and socioeconomics of households. By analyzing cross-sectional data from the Indonesia National Survey of Financial Literacy and Inclusion, this research bring novelty on seven types of financial services accessed by households. The results show that financial literacy plays a significant and positive role in promoting financial inclusion across different financial service categories. Additionally, digital finance emerges as a key factor in enhancing access to financial services, particularly for households with internet access. The study also highlights the importance of socioeconomic characteristics, such as income, age, education, and rural-urban divide, in influencing financial inclusion. Furthermore, the research addresses issue of financial vulnerability and impact on household financial stability, emphasizing the need for financial planning and education to mitigate risks and improve financial well-being. Ultimately, this study contributes to the existing literature on financial inclusion by providing insights into the factors that drive access to financial services in developing countries, offering implications for policymakers, financial institutions, and stakeholders to enhance financial inclusion initiatives and promote economic empowerment.

Keywords: Financial Literacy, Financial Inclusion, Financial Vulnerability, Digital Finance

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Introduction

In 2005, the United Nations coined the term "financial inclusion" to describe a financial system that aims to provide effective, comprehensive, and convenient services to everyone without exception. Financial inclusion enables individuals, particularly those living in poverty, to overcome their financial difficulties by accessing and utilizing financial services effectively, thus reducing income disparities between urban and rural areas. However, the implementation of financial inclusion faces complex challenges (United Nations, 2018).

Many countries prioritize economic policies that influence individual financial decisions. Developed countries, including Finland, Denmark, Sweden, and the Netherlands, have implemented various policies to promote financial inclusion among their citizens (Gómez-Barroso & Marbán-Flores, 2013). In contrast, financial inclusion in developing countries is more complex compared to developed nations. Innovative financial services have helped improve financial access in several African nations. However, high costs and geographical challenges remain significant obstacles to financial inclusion in developing regions of Asia and the Middle East and North Africa (MENA) (Ozili, 2021).

Recent literature highlights the critical role of financial literacy in influencing socio-economic outcomes, particularly in addressing wealth inequality and promoting financial well-being. Studies such as Lusardi and Mitchell's (2023) work emphasize the connection between financial knowledge and effective resource management. Similarly, Zaimovic et al. (2023) explore determinants and trends in financial literacy, underscoring its impact on economic stability and poverty reduction efforts. These findings suggest that targeted educational strategies can significantly enhance both individual financial security and broader socio-economic development.

While financial inclusion is considered an important element for societies worldwide, researchers have raised concerns about the likelihood of individuals entering the financial ecosystem. The concept of financial inclusion does not adequately explore individuals' or households' ability to regularly use financial instruments, leading to dynamic financial situations (Salignac et al., 2016). The Organization for Economic Cooperation and Development (OECD, 2022) acknowledges this issue and regularly revises its survey instruments to assess financial inclusion globally

In the context of Indonesia as proxy of multidimensional developing nation, a country comprised of thousands of islands, the distribution problem becomes complex across its 34 provinces, resulting in operational budget constraints for financial institution branches. Additionally, rural areas, where a large portion of the population resides, are still excluded from the financial system and burdened by informal financial services that charge high interest rates for loans and engage in fraudulent investment schemes. This study aims to address the role of digital financial services in overcoming these challenges.

Objectives

Studies examining the effects of financial inclusion, digital finance and financial vulnerability on the various socioeconomics settings are limited. This study will utilize cross-sectional data from 67 districts/cities obtained from National Survey of Financial Literacy and Inclusion 2019 to investigate the role of financial literacy, digital finance, and socioeconomic attributes as determinants of financial inclusion and explore the relationship between financial inclusion and financial vulnerability in Indonesian households. Therefore, this study aims to make several contributions:

1. Explores the characteristics of household financial inclusion across various socioeconomic attributes, enriching the existing literature and providing implications for stakeholders.

2. To address gaps in previous research by Morgan and Long (2020), which focused only on limited financial inclusion with savings activity, by considering seven different types of financial inclusion that play distinct roles in the household financial journey.

Literature Review

Financial Inclusion - The practice of having individuals, particularly the poor get basic financial services in the legitimate financial system is known as financial inclusion (Ozili, 2021). Policymakers and researchers have paid close attention to financial inclusion. Financial inclusion believes will become society main key to achieving the United Nation's SDGs (especially for Goal 12: responsible consumption and production) (Demirguc-Kunt et al., 2017). Beside of that, financial inclusion proven to improve the level of social justice in economic (lower Gini Index) (Bold et al., 2012). Finally, more people in financial ecosystem prevent people in the poverty trap (Neaime & Gaysset, 2018) and increase quality of life (Sarma & Pais, 2011) Several nations' governments seek to dedicate extensive amounts to increasing the level of financial inclusion in their country to eliminate financial exclusion.

Developing nations have specific ways to increase financial inclusion in their respective area, behavioral and geospatial aspect seen as distinctive aspect to be considered. For example, Innovative financial services helped to improve financial access to several African nations (Ozili, 2021). Ultimately, recent study in 21 developing countries identified found empirical results that show the impact on financial inclusion (i.e., reduced income inequality) appears more significant for countries receiving high financial aid flows (Lee et al., 2022).

Several concepts that explain beyond financial inclusion also appears last decade, financial literacy (Lusardi & Mitchell, 2014), financial capability (Serido et al., 2013) and financial resilience (Salignac et al., 2016). Furthermore, this study stresses dynamic settings of financial inclusion that are faced by households in the today modern financial ecosystem.

Digital Finance - International Telecommunication Union (ITU, 2016) asserts that the principal objective of digital financial services is to alleviate poverty and promote financial inclusion in developing economies. These services typically comprise three essential components: a digital transactional platform, retail agents, and the utilization of devices, particularly mobile phones, by customers and agents to conduct transactions through the digital platform (Lauer & Lyman, 2015). Policymakers and researchers increasingly acknowledge the significance of digital finance and financial inclusion in reducing poverty and fostering economic growth. By addressing the persistent challenges associated with digital finance, it is possible to achieve better outcomes for individuals, businesses, governments, and the overall economy.

Both in developed and developing nations, the internet has emerged as a widely adopted distribution channel for the banking industry, with traditional banks and new entrants recognizing its effectiveness (Saraf & Kayal, 2022). Digital financial inclusion is also crucial in countries with income disparity between rural and urban societies (Ji et al., 2021). In this study, three proxies were employed to measure digital finance: infrastructure (internet access), awareness of digital finance, and the utilization of digital finance product (s).

Financial Vulnerability - The definition of household financial vulnerability lacks consensus in the existing literature. Anderloni et al., (2012) propose that financial vulnerability arises when households resort to short-term borrowing to meet their financial needs, resulting in debt levels that surpass their current and future earning capacity. Thus, debt constitutes a crucial component of financial vulnerability. Delinquent debt risk is typically associated with home loans and younger households, which tend to have higher levels of debt (Artavanis et al., 2018; Chan, 2020). Financial vulnerability can also stem from factors other than debt, including low income and wealth levels, lifestyle behaviors driven by irresponsibility, unsustainable expenditures or suboptimal money management, adverse events impacting financial situations, and the absence of financial instruments such as insurance policies to manage risks effectively (Lee & Sabri, 2017; Lusardi et al., 2020; Noerhidajati et al., 2021; O'Connor et al., 2019). Consequently, a comprehensive understanding of household financial vulnerability incorporates financial, demographic, and socioeconomic characteristics.

Extensive research efforts have been dedicated to exploring the origins of household financial vulnerability. O'Connor et al., (2019) discuss that individuals exhibit varied perspectives on financial vulnerability. The variety of financial products and services introduces complexities as individuals are increasingly perceived as commodities within the financial industry. Notably, researchers have primarily concentrated on financial dimensions, leaving non-financial facets, such as demographic and social characteristics, largely unexplored. This study takes a primary focus on assessing short-term household financial vulnerability. By extensive cross-sectional data, this research endeavor to provide a holistic comprehension of the multifaceted nature of household financial vulnerability.

Hypothesis and Conceptual Model

The national surveys dataset gathered by researcher called National Survey of Financial Inclusion and Literacy year 2019. The data collection method at this survey is using the interview/enumeration process (enumeration) directly/face to face interview by multistage random sampling approach. Meanwhile, the selection of respondents in each region was carried out using a random sampling approach by looking for respondents in a predetermined area. Like first paper, dataset of this study presents extensive individual's socioeconomics information coverage compared to previous literature reviews that focus on gender, education, age, and income (Goyal & Kumar, 2021; Santini et al., 2019).

Dependent Variable - Financial Inclusion of household is a dependent Variable of this study. The proxy of the dependent variable taken from the survey that stated, *"Do you (personally or collectively) have an account and/or use the following financial products and services in last 1 year?"*. There are 28 multiple choices of formal financial institution with 58 products that asked to respondent. We classify all financial products and services usage into seven categories of financial inclusion that will be observe in current study as dummy variables. The seven categories namely, (1) Bank, (2) Insurance Financial Services, (3) Investment Financial Services, (4) Consumers Credit Financial Services, (5) Informal Financial Services, (6) Alternative Financial Services (Microfinance, Credit Union, or Fintech), and (7) Government Social Security.

Financial vulnerability proxies by negative income leftovers and expenses (Ampudia et al., 2016; Anderloni et al., 2012; Lee & Sabri, 2017). In line with this established practice, the present study time series dataset, monthly financial leftovers ratio and monthly expenses become suitable metrics to evaluate the extent of a period of household facing financial vulnerability. Data treatment of income leftovers gained from the ratio of income leftovers (income – expenses) divided by income itself. From the dataset, we got unique real numbers that stated monthly income and expenses of respondent in Indonesia Rupiah (IDR).

Independent Variable - Socioeconomics factors and financial literacy become incremental factors that gathered from National Survey Dataset. Additionally, this paper independent variables also stress the importance of digital finance and financial plan. Digital finance with three different types of proxies based on the level of interaction to digital finance. From the three proxies of digital finance, researcher address the pattern of behavior of digital finance adoption. Ultimately, dummy variable was created to understand the general household financial plan.

Methodology

Analytical Procedure - In order to accomplish these objectives, I employ various regression specifications, so the results and findings obtained are rigorously tested and verified to ensure reliability and validity. To test the FI models, this study modified the logistic regression model of Ozili, (2018), while for financial vulnerability linear regression model adopt the approach of objective financial vulnerability of Midões and Seré, (2022); Noerhidajati et al., (2021).

The analysis was conducted in five steps: (1) gathered data on socioeconomics factors, digital finance, financial plan and financial inclusion from SNLKI 2019; (2) code and classify independent and dependent variables, specifically for financial inclusion it was classify on seven category of financial services; (3) create two scoring based financial inclusion (equally weighted scoring/EWS and unequally weighted scoring/UWS) for robustness test; (4) logit (binary) regression and negative binomial regression were conducted to test the relationship of socioeconomics factors, digital finance, financial plan and financial inclusion; (5) linear regression (OLS) was conducted to test the role of financial vulnerability as dependent variable that determined by financial inclusion, socioeconomics factors, digital finance and financial plan. Besides, negative binomial regression administered for robustness test.

Descriptive Results - First of all, the most popular financial services that are used by respondents are alternative financial services (93.92%), bank (73.42%), government social security (27.78%) and informal (6.86%). The results for bank and social security are expected, but alternative financial services as the most chosen financial services unexpectedly. Alternative financial services such as microfinance and fintech become solution of financial access in the wide spreading region of developing nations (Birkenmaier & Fu, 2016; Friedline & Kepple, 2017; Robb et al., 2015).

The financial vulnerability of this study is measured by ratio of income leftovers and log-expenses. The income leftovers ratio ranged from -5 to 1 with a positive mean value of 0.195, positive value of income leftovers ratio means households able to cover their monthly needs. The income leftovers ratio value near to 1.00 may found due to zero or very low expenses data reported. This result is mostly found on the respondent that categorized as student or young employee that still live in the parents' house. The average income structure of the respondents was USD 160.655 which classified as low-middle class income from socioeconomic status (SES) classification, while average expenses were USD 125.56. Additionally, most households have a general financial plan (88.82%).

Digital finance profiles in this study covers internet access, knowledge of digital finance and use of digital finance. Most households have internet access (92.93%), with 35.51% acknowledging digital finance products and 11.09% use digital finance products/services. Exposure of internet access across urban-rural areas is one of the bright sides of the development of financial inclusion in Indonesia (Talitha et al., 2020).

Results

Result for Model 1: Financial Inclusion - Table 1 present the regression results of three models namely financial inclusion, weighted financial inclusion and financial vulnerability. This paper aimed to identify the role of financial inclusion and financial vulnerability in Indonesia's household, extent to which to the emerging of digital finance, importance of financial literacy and variability in socioeconomic factors. To cope with the research agenda, we identify five research questions; (1) What socioeconomics factors, such as income, education, and regional differences contribute to the financial inclusion of household in Indonesia?; (2) Are households in Indonesia has different behavior in using formal and informal financial products?; (3) What role do financial literacy play in determining financial inclusion of household in Indonesia?; (4) To what extent the use of digital finance and household financial plan impact the financial inclusion in Indonesia?. The financial inclusion model is presented in Equation (Eq) (1):

$$\begin{aligned} logit\ (Financial\ Inclusion\ _i) \\ = \quad & \beta_0 + \beta_1 \cdot Financial\ Literacy_i + \beta_2 \cdot \log(income_i) + \beta_3 \cdot Age_i + \\ & \beta_4 \cdot Rural_i + \beta_5 \cdot Male_i + \Sigma\big(\beta_{6j} \cdot Regional_{ij}\big) + \\ & \beta_7 \cdot Education_i + \Sigma(\beta_{8k} \cdot Occupation_{ik}) + \beta_9 \cdot Non - Single\ Family_i \\ & \beta_{10} \cdot Digital\ Finance_i + \beta_{11} \cdot Financial\ Goal\ _i + \varepsilon_i \end{aligned}$$

(Eq. 1)

In essence, the research underscores the multifaceted nature of financial inclusion, revealing the nuanced interplay between socioeconomic factors, digital access, and financial literacy. It emphasizes the importance of targeted interventions aimed at enhancing financial literacy, expanding digital infrastructure, and addressing regional disparities to foster greater inclusivity across various financial services, and contributing economic growth and stability.

Result for Model 2: Financial Vulnerability - To answer the last research question of the study "What role do financial inclusion play in determining financial vulnerability of household in Indonesia?", this study identify the dynamic model of financial vulnerability model is presented as in Equation (Eq) (2). The model of financial vulnerability consists of two dependent variables which represent different proxies in order to see the interaction among variables and assess robustness of the dataset.

$$\begin{aligned} OLS\ (Financial\ Vulnerability\ _i) \\ = \quad & \beta_0 + \beta_1 \cdot Financial\ Inclusion_i + \beta_2 \cdot Financial\ Literacy_i + \beta_3 \cdot Age_i \\ & \beta_4 \cdot Rural_i + \beta_5 \cdot Male_i + \Sigma\big(\beta_{6j} \cdot Regional_{ij}\big) + \\ & \beta_7 \cdot Education_i + \Sigma(\beta_{8k} \cdot Occupation_{ik}) + \beta_9 \cdot Non - Single\ Family_i \\ & \beta_{10} \cdot Digital\ Finance_i + \beta_{11} \cdot Financial\ Goal\ _i + \varepsilon_i \end{aligned}$$

(Eq. 2)

Factors such as financial inclusion, financial literacy, regional/ethnicity differences (Papua, Maluku, Kalimantan, Sulawesi, Bali Nusa Tenggara, and Sumatra Islands), occupation (entrepreneur, employee/professional, housewife, farmer/fisherman, and retired), digital finance (knowledge of digital finance, use of digital finance), and financial plans exert positive influences on "Financial Vulnerability" by leading to a positive value of income leftovers ratio. However, informal financial inclusion, younger age, occupation (student), and digital finance (internet access) have negative influences on "Financial Vulnerability" by resulting in a negative value of income leftovers ratio.

Financial Vulnerability: Positive influences on "Financial Vulnerability" by leading to higher expenses are observed from factors such as financial inclusion, informal financial inclusion, age, gender (male), occupation (entrepreneur, employee/professional, housewife, farmer/fisherman, and retired), and digital finance (internet access). However, financial literacy, rural areas, regional/ethnicity differences (Papua, Maluku, Kalimantan, Sulawesi, and Bali-Nusa Tenggara), and low education exert negative influences on "Financial Vulnerability" by leading to lower expenses. Furthermore, figure 1 summarizes the dynamic interaction of income leftovers and expenses.

Robustness Test - This study checks the robustness of the results using an alternative measure of financial inclusion. To test robustness of the data, this study adds two additional measurements for financial inclusion variable, namely Equal Weighted Scoring (EWS) and Non-Equal Weighted Scoring (NWS) from seven sub-categories of financial service. The NWS as proxy of financial inclusion adapted from (Mader, 2018) which mention household constantly require financial instruments to enhance their efficiency and ensure optimal case from consumption to investment, while also effectively handling potential or existing risks. For that reason, we give more weight (1.5 times) to the Bank, Insurance and Investment that categorized as basic financial services selection for household. This approach follows Grohmann et al. (2018) that measures financial inclusion into four different proxies. The term “financial inclusion” denotes measuring by this alternative method with the similar regression model and analyzing with different statistical method (negative binomial regression) for the model.

Based on the Poisson distribution test conducted for financial inclusion model, the data is found overdispersion. The results show that as for the different approach to measure of financial inclusion is also affected by factors such as financial literacy, income, age, regional/ethnicity differences, occupation, latest education, digital finance, and financial plan. The effect and statistical significance of the variables are similar for both measurement methods for financial inclusion, in other words, issues related to measuring financial inclusion do not create biases in the model. To conclude, the results did not change when the model checked its robustness in two ways: (i) using a different measurement for dependent variable and (ii) using different statistic test for the model.

Table 1 Result of Logit Model Estimation for Financial Inclusion as Dependent

Financial Inclusion Variables	Bank (OR)	Insurance (OR)	Invest. (OR)	C.Credit (OR)	Informal (OR)	Altern. (OR)	Social S. (OR)
Financial Literacy	0.272***	0.244***	0.098	0.201***	0.362***	0.222***	0.096***
	(1.313)	(1.276)	(1.103)	(1.223)	(1.436)	(1.249)	(1.101)
(Log) Income	1.249***	0.495***	0.971***	0.324***	1.030***	0.342***	0.444***
	(3.485)	(1.641)	(2.64)	(1.383)	(2.802)	(1.408)	(1.559)
Age	-0.004*	-0.009**	0.030**	-0.011***	0.001	-0.006*	0.014***
	(0.996)	(0.991)	(1.031)	(0.989)	(1.001)	(0.994)	(1.015)
Rural	0.091	-0.016	-0.134	-0.182*	0.297***	-0.288***	-0.248***
	(1.096)	(0.984)	(0.874)	(0.834)	(1.346)	(0.75)	(0.78)
Male	-0.038	-0.007	-0.497**	-0.095	-0.247**	-0.291***	-0.015
	(0.962)	(0.993)	(0.608)	(0.91)	(0.781)	(0.748)	(0.985)
Papua	-0.674***	-1.846***	-1.095*	-2.668***	-1.956***	-4.695***	-0.826***
(Region)	(0.509)	(0.158)	(0.335)	(0.069)	(0.141)	(0.009)	(0.438)
Maluku	0.250**	-0.006	0.334	-1.439***	-0.733***	-1.526***	-0.836***
(Region)	(1.284)	(0.994)	(1.396)	(0.237)	(0.481)	(0.217)	(0.433)
Kalimantan	0.023	-0.417***	-0.469	-1.130***	-0.828***	-0.660***	-0.717***
(Region)	(1.024)	(0.659)	(0.626)	(0.323)	(0.437)	(0.517)	(0.488)
Sulawesi	-0.089	-0.334**	-1.798***	-0.021	-0.549***	-0.906***	-0.006
(Region)	(0.915)	(0.716)	(0.166)	(0.979)	(0.577)	(0.404)	(0.994)
Bali-Nusa	-0.412***	-0.296*	-0.164	-0.557***	0.003	0.052	-1.056***
(Region)	(0.662)	(0.744)	(0.849)	(0.573)	(1.003)	(1.054)	(0.348)
Sumatra	-0.265***	-0.159	-0.731**	-0.008	-0.652***	-1.029***	-0.757***
(Region)	(0.767)	(0.853)	(0.481)	(0.992)	(0.521)	(0.357)	(0.469)
Not Finish K12	-1.618***	-0.765***	-1.125***	0.040	-0.662***	-0.555***	-0.062
	(0.198)	(0.465)	(0.325)	(1.04)	(0.516)	(0.574)	(0.94)

Table 1 Result of Logit Model Estimation for Financial Inclusion as Dependent (Continue)

Financial Inclusion Variables	Bank (OR)	Insurance (OR)	Invest. (OR)	C.Credit (OR)	Informal (OR)	Altern. (OR)	Social S. (OR)
Entrepreneur	0.876***	0.185	0.288	0.756**	0.460	0.066	-0.124
(Occupation)	(2.402)	(1.203)	(1.334)	(2.131)	(1.584)	(1.068)	(0.883)
Employee	0.655***	0.284	0.062	0.756***	0.514*	0.108	-0.055
(Occupation)	(1.925)	(1.328)	(1.064)	(2.129)	(1.672)	(1.114)	(0.947)
Student	0.478***	0.263	0.099	-0.390	0.081	0.293	-0.005
(Occupation)	(1.612)	(1.301)	(1.104)	(0.677)	(1.084)	(1.341)	(0.995)
Housewife	0.452***	0.281	-3.086**	0.595**	0.530*	-0.142	0.060
(Occupation)	(1.571)	(1.324)	(0.046)	(1.812)	(1.699)	(0.868)	(1.062)
Farmer/Fisherman	0.292**	-0.044	-	-0.297	0.098	0.363	-0.028
(Occupation)	(1.339)	(0.957)	(1)	(0.743)	(1.103)	(1.438)	(0.972)
Retired	1.168***	0.163	2.769***	0.122	0.994***	-0.478	0.194
(Occupation)	(3.214)	(1.177)	(15.938)	(1.13)	(2.702)	(0.62)	(1.214)
Non-Single Family	0.105	0.222**	-0.161	0.066	0.246**	0.018	0.053
	(1.111)	(1.249)	(0.851)	(1.069)	(1.279)	(1.018)	(1.055)
Internet Access	0.129	0.148	-	-0.413*	0.329	0.582**	0.262**
(Digital Finance)	(1.138)	(1.159)	(1)	(0.662)	(1.39)	(1.79)	(1.3)
Know Digital FS	0.592***	0.319***	-0.327	0.280***	0.514***	0.185*	0.124**
(Digital Finance)	(1.808)	(1.375)	(0.721)	(1.323)	(1.673)	(1.204)	(1.132)
Use Digital FS	-0.047	0.273**	0.009	0.134	-0.026	1.115***	-0.070
(Digital Finance)	(0.954)	(1.314)	(1.009)	(1.144)	(0.975)	(3.05)	(0.933)
Financial plan	0.427***	0.203	-0.067	0.079	0.514***	-0.607***	-0.263***
	(1.533)	(1.225)	(0.935)	(1.082)	(1.673)	(0.545)	(0.769)
Constant	-17.072***	-10.383***	-19.498***	-7.552***	-19.300***	-7.102***	-7.512***

Note. This model presents the association between Financial Literacy, Digital Finance, Financial plan, Socioeconomics Characteristics and Financial Inclusion. The logit model shows Financial Inclusion for Bank, Insurance, Investment, Consumer Credit, Informal, Alternative Financial Services, Government Social Securities with log-likelihood -5158.9, -2475.83, -367.48, -2274.16, -2550.41, -2486.45 and -7043.91 respectively , LR chi^2 (23) is 4474, 633.17, 346.99, 436.32, 1284.54, 878.03 and 1005.73 respectively and model fits at Pseudo R2 value 0.403, 0.113, 0.321, 0.088, 0.201, 0.15, 0.07 respectively; The value of Prob > chi2 is 0.000 for all models, and the observation is 12773. ***, **, * refer significance level at 99%, 95%, 90% respectively. The value within the first bracket is the odd ratio value.

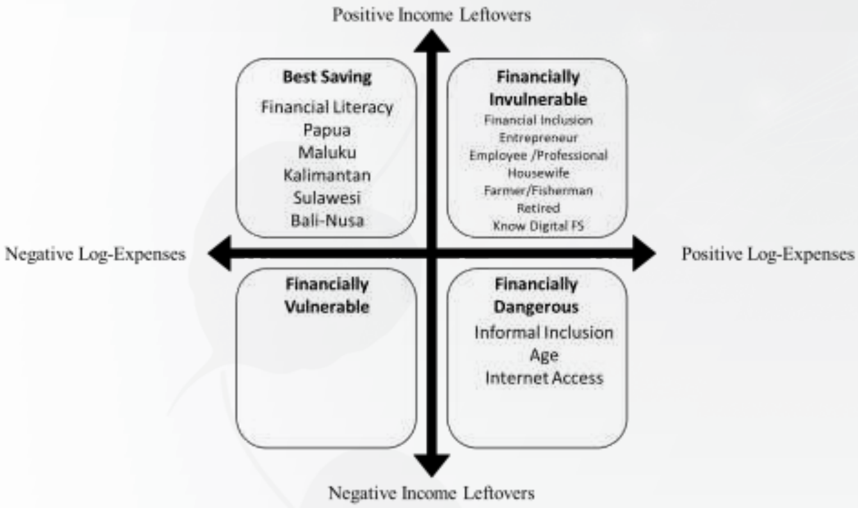

Figure 1 Financial Vulnerability Matrix: Income Leftovers and Log-Expenses

Discussion

Financial Inclusion and Financial Literacy - Financial literacy found significant and positive leads to financial inclusion in bank, insurance, consumer credit, informal, alternative and government social security financial services. This result extends the result from Morgan and Long, (2020) that found financial literacy has positive and significant influence on financial inclusion and savings. This study bank financial inclusion equal to savings, while this study adds safety nets (insurance and government social security) and debt related (consumer credit, informal and alternative financial services) to financial inclusion body of knowledge.

Financial literacy with several sub-category (e.g., interest and inflation) has its role in achieving financial inclusion (Bongomin et al., 2018; Klapper & Lusardi, 2020) This study introduces equally weighted score (EWS) financial literacy which construct based on four concepts of ability to count (1) Interest or Profit Sharing, (2) Installment Debt, (3) Investment Result, (4) Financial Service Fee & Penalty and (5) Inflation or Time Value of Money. This measurement with simple and short question is able reflect the nature of Indonesian society that tend to not open to financial circumstance.

Incremental Role of Digital Finance in Indonesia - The role of digital finance in Indonesia has been gradually increasing. There is a positive and significant relationship between digital finance and financial inclusion, particularly when considering the proxy of knowledge or awareness of digital financial services. This finding aligns with the study conducted by Rekha et al., (2021), which investigated the impact of digital finance on financial inclusion in emerging economies, indicating a positive long-term effect. It highlights the significance of creating an economic environment conducive to sustained economic growth.

The convenience offered by digital finance often outweighs the higher costs associated with obtaining services from traditional regulated financial institutions.

Technology-driven advancements in financial services, facilitated by digital finance, have proven to have positive effects on financial inclusion in both emerging and advanced economies (Ozili, 2018). This study sheds light on financial inclusion across various financial services, including banking, insurance, and alternative financial services, which have witnessed technological advancements. Notably, digital finance does not significantly contribute to financial inclusion in the investment sector. This implies that digital transformation needs to be further developed to establish a better investment environment for households.

Socioeconomic Factors and Financial Inclusion - Income significantly influences financial inclusion, aligning with findings from 116 developing nations (Omar & Inaba, 2020). Male gender also plays a positive role, consistent with prior studies (Adegbite & Machethe, 2020; Arnold & Gammage, 2019). This study expands gender analysis by examining its impact on investment, informal, and alternative financial services.

Age and rural residence yield mixed results. Older individuals favor investment and government social security, while younger ones prefer insurance and consumer credit (Friedline & Rauktis, 2014). Financial inclusion is vital for young adults, who need more than savings accounts for spending and asset building (Lee et al., 2022; Harvey, 2019). Rural residents show lower inclusion in government social security and alternative finance, emphasizing the need to bridge urban-rural financial disparities (Koomson et al., 2022; Rodríguez-Pose & Hardy, 2015).

Regional disparities exist, with Maluku showing strong bank inclusion due to the "Laku Pandai" branchless banking initiative. However, low K12 education levels negatively impact financial inclusion, reinforcing the importance of integrating financial literacy into curricula (Carlin & Robinson, 2012; Hütten et al., 2018).

The Role of Financial Plan - The general financial plan significantly impacts financial inclusion, favoring banks and informal financial services while negatively affecting alternative and social security financial services. This trend reflects households' dual needs for basic financial services and aspirations for improved livelihoods. While government social security is mandatory for all households in Indonesia, starting financial planning typically begins with legitimate banks for various purposes such as small business, education, or pension, as emphasized by Ozili (2021).

However, current findings reveal that Indonesian households often resort to alternative financial services even without a financial plan, echoing Robb et al.'s (2015), users of such services may make suboptimal financial decisions due to inadequate research. This reliance on high-interest alternative and informal financial services, less regulated by the government, increases the risk of household default. Lee et al. (2020) highlight that households seek financial information when planning for their family's future financial objectives, underscoring the importance of enhancing basic financial knowledge and literacy to guide household financial service choices and detect financial fraud, as suggested by Engels et al. (2020).

Financial Inclusion and Financial Vulnerability in Indonesia Household - The latest Indonesian study on financial vulnerability by Noerhidajati et al. (2021) challenges the conventional approach of using income as the sole determinant, instead employing income leftovers and expenses dynamics as proxies for objective financial vulnerability. Interestingly, the study reveals that higher financial literacy and residing in relatively less developed regions, particularly in Papua, Maluku, Kalimantan, Sulawesi, and Bali-Nusa Tenggara, are associated with lower financial vulnerability. He et al. (2020) advocate for comprehensive education programs, especially in rural areas, to mitigate financial vulnerability and achieve financial freedom. Additionally, the study demonstrates that financial inclusion leads to increased expenses and income leftovers for various demographic groups, aligning with previous research indicating employment status as a significant factor in explaining financial vulnerability (He et al., 2020; Noerhidajati et al., 2021). Effective utilization of financial services across employment statuses indicates positive money management practices within society.

Furthermore, the study highlights diverse effects of digital finance proxies. While internet access leads to decreased income leftovers and increased spending, awareness of digital financial services correlates with higher income leftovers and expenses, underscoring the importance of financial literacy (Patwardhan, 2018). Government initiatives and industry efforts in digital finance education and promotion signify a shift towards digitalization as a key indicator of societal well-being (Central Bank of Indonesia, 2019). Lastly, the study emphasizes the informal financial services use among older demographics, as it leads to higher expenses and lower income leftovers. This aligns with trends observed in neighboring countries like Vietnam, where older individuals exhibit the lowest savings behavior (Esquivias et al., 2021).

Recommendation

Implications to Multi-stakeholders' Engagement - To ensure social learning and sustainable impact in development processes, it is crucial to construct multi-stakeholder frameworks that prioritize engagement from the outset, as emphasized by Leventon et al. (2016) and Chinseu et al. (2022). However, identifying stakeholders, particularly in developing regions, presents challenges due to historical marginalization. Successful interventions necessitate the identification of influential opinion leaders capable of fostering societal trust, particularly within sub-regional contexts, as highlighted by Crane and Ruebottom (2011).

Within academia, integrating financial inclusion into early education curricula is paramount for cultivating a mindset geared towards effective financial management. Lusardi et al. (2021) advocate embedding financial inclusion principles to counteract consumerist trends, fostering financial mindfulness and minimalism. The study underscores the pivotal roles of society, entrepreneurs, and homemakers in Indonesia's financial inclusion agenda, emphasizing the need for diverse stakeholders, including academia, entrepreneurs, NGOs, and media, to counterbalance the influence of powerful entities within the financial industry (Hussain et al., 2021; Lyons & Kass-Hanna, 2021; Sarma & Pais, 2011).

Limitation and Future Study - Financial inclusion in this study limited to the use of specific financial products and services that classify into seven subcategories. In the rapid development of technology and financial innovation, the typology of financial inclusion may be extended in further analysis. This study should be seen as strategic or helicopter view of financial inclusion study that opens the new fields of financial inclusion theme by analyzing financial inclusion generally in seven subcategories. Each detail of subcategory of financial inclusion has unique characteristics that may not able be covered in this study due to limitation of research scope. Future research that focusses on specific financial products/services inclusion in different developing or developed nation context will be interesting to conduct.

This research utilized a government dataset, which inevitably led to certain limitations in the available proxies for variables, owing to restrictions on the questions collected. This could potentially introduce measurement errors into certain variables. To mitigate this issue, the researchers conducted several robustness checks as explained in the previous sections. The SNLKI 2019 dataset was unable to account for more recent phenomena, such as the financial literacy landscape during and post the COVID-19 crisis. Future studies using time series datasets should be able to cover recent issues, including but not limited to, the COVID-19 crisis, the role of women in finance, and the rapid development of the financial technology.

References

Adegbite, O. O., & Machethe, C. L. (2020). Bridging the financial inclusion gender gap in smallholder agriculture in Nigeria: An untapped potential for sustainable development. *World Development*, *127,* Article 104755. https://www.sciencedirect.com/science/article/abs/pii/S0305750X19304048

Ampudia, M., van Vlokhoven, H., & Zochowski, D. (2016). Financial fragility of euro area households. *Journal of Financial Stability*, *27*, 250–262. https://doi.org/10.1016/j.jfs.2016.02.003

Anderloni, L., Bacchiocchi, E., & Vandone, D. (2012). Household financial vulnerability: An empirical analysis. *Research in Economics*, *66*(3), 284–296. https://doi.org/10.1016/j.rie.2012.03.001

Arnold, J., & Gammage, S. (2019). Gender and financial inclusion: the critical role for holistic programming. *Development in Practice*, *29*(8), 965–973. https://doi.org/10.1080/09614524.2019.1651251

Artavanis, N. T., Karra, S., & Kechagias, S. (2018). Financial literacy and student debt. In G. A. Panos & J. O. S. Wilson (Eds.). *Financial literacy and responsible finance in the fintech era: Capabilities and challenges* (pp. 1-17). Routledge. http://ifin-workshop.iti.gr/files/Financial_Literacy_Student_Debt.pdf

Birkenmaier, J., & Fu, Q. (2016). The association of alternative financial services usage and financial access: Evidence from the national financial capability study. *Journal of Family and Economic Issues, 37*(3), 450–460. https://doi.org/10.1007/s10834-015-9463-2

Bold, C. E., Porteous, D. J., & Rotman, S. C. (2012). Social cash transfers and financial inclusion: evidence from four countries : Transferts sociaux et inclusion financière : étude de quatre pays (French). *CGAP focus notes no.77*, World Bank Group. https://shorturl.asia/K4moC

Bongomin, G. O. C., Munene, J. C., Ntayi, J. M., & Malinga, C. A. (2018). Nexus between financial literacy and financial inclusion: Examining the moderating role of cognition from a developing country perspective. *International Journal of Bank Marketing*, *36*(7), 1190–1212. https://doi.org/10.1108/IJBM-08-2017-0175

Carlin, B. I., & Robinson, D. T. (2012). What does financial literacy training teach us?. *The Journal of Economic Education*, *43*(3), 235–247. https://doi.org/10.1080/00220485.2012.686385

Central Bank of Indonesia. (2023). *Innovation for integration of digital economy & finance 2019*.

Chan, S. (2020). China's rising household debt: A new debt trap?. *Economic Alternatives*, *26*(4), 567–578. https://doi.org/10.37075/EA.2020.4.04

Chinseu, E. L., Dougill, A. J., & Stringer, L. C. (2022). Strengthening conservation agriculture innovation systems in sub-Saharan Africa: lessons from a stakeholder analysis. *International Journal of Agricultural Sustainability*, *20*(1), 17–30. https://doi.org/10.1080/14735903.2021.1911511

Crane, A., & Ruebottom, T. (2011). Stakeholder theory and social identity: Rethinking stakeholder identification. *Journal of Business Ethics, 102*(S1), 77–87. https://doi.org/10.1007/s10551-011-1191-4

Demirguc-Kunt, A., Klapper, L., & Singer, D. (2017). *Financial inclusion and inclusive growth: A review of recent empirical evidence.* Policy Research Working Paper Series 8040, The World Bank. https://shorturl.asia/HZytx

Engels, C., Kumar, K., & Philip, D. (2020). Financial literacy and fraud detection. *European Journal of Finance, 26*(4–5), 420–442. https://doi.org/10.1080/1351847X.2019.1646666

Esquivias, M. A., Sethi, N., Ramandha, M. D., & Jayanti, A. D. (2021). Financial inclusion dynamics in Southeast Asia: An empirical investigation on three countries. *Business Strategy and Development, 4*(2), 203–215. https://doi.org/10.1002/bsd2.139

Friedline, T., & Kepple, N. (2017). Does community access to alternative financial services relate to individuals' use of these services? beyond individual explanations. *Journal of Consumer Policy*, *40*(1), 51–79. https://link.springer.com/article/10.1007/s10603-016-9331-y

Friedline, T., & Rauktis, M. (2014). Young people are the front lines of financial inclusion: A review of 45 years of research. *Journal of Consumer Affairs*, *48*(3), 535–602. https://doi.org/10.1111/joca.12050

Gómez-Barroso, J. L., & Marbán-Flores, R. (2013). Basic financial services: A new service of general economic interest?. *Journal of European Social Policy, 23*(3), 332–339. https://doi.org/10.1177/0958928712471226

Goyal, K., & Kumar, S. (2021). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, *45*(1), 80–105. https://doi.org/10.1111/ijcs.12605

Grohmann, A., Klühs, T., & Menkhoff, L. (2018). Does financial literacy improve financial inclusion? cross country evidence. *World Development*, *111*, 84–96. https://doi.org/10.1016/j.worlddev.2018.06.020

Harvey, M. (2019). Impact of financial education mandates on younger consumers' use of alternative financial services. *Journal of Consumer Affairs, 53*(3), 731–769. https://doi.org/10.1111/joca.12242

He, T., Derfler-Rozin, R., & Pitesa, M. (2020). Financial vulnerability and the reproduction of disadvantage in economic exchanges. *Journal of Applied Psychology, 105*(1), 80–96. https://doi.org/10.1037/apl0000427

Hussain, M., Yahya, F., & Waqas, M. (2021). Does strong governance stimulate the effect of economic freedom and financial literacy on financial inclusion? A cross-country evidence. *Future Business Journal, 7*(1), 1-10. https://doi.org/10.1186/s43093-021-00090-9

Hütten, M., Maman, D., Rosenhek, Z., & Thiemann, M. (2018). Critical financial literacy: An agenda. *International Journal of Pluralism and Economics Education, 9*(3), 274–291. https://doi.org/10.1504/IJPEE.2018.093405

International Telecommunication Union (ITU). (2016). *Digital financial inclusion*. United Nations. https://shorturl.asia/kzgim

Ji, X., Wang, K., Xu, H., & Li, M. (2021). Has digital financial inclusion narrowed the urban-rural income gap: The role of entrepreneurship in China. *Sustainability, 13*(15), 1-18. https://doi.org/10.3390/su13158292

Klapper, L., & Lusardi, A. (2020). Financial literacy and financial resilience: Evidence from around the world. *Financial Management, 49*(3), 589–614. https://doi.org/10.1111/fima.12283

Koomson, I., Ansong, D., Okumu, M., & Achulo, S. (2022). Effect of financial literacy on poverty reduction across Kenya, Tanzania, and Uganda. *Global Social Welfare, 10*(1), 93–103. https://doi.org/10.1007/s40609-022-00259-2

Lauer, K. & Lyman, T. (2015). *Digital financial inclusion: Implications for customers, regulators, supervisors, and standard-setting bodies* (pp. 1-7). CGAP. https://shorturl.asia/SgKLT

Lee, C.-C., Wang, C.-W., & Ho, S.-J. (2022). Financial aid and financial inclusion: Does risk uncertainty matter?. *Pacific-Basin Finance Journal*, *71*(42), Article 101700. https://doi.org/10.1016/j.pacfin.2021.101700

Lee, J. M., Lee, J., & Kim, K. T. (2020). Consumer financial well-being: Knowledge is not enough. *Journal of Family and Economic Issues, 41*(2), 218–228. https://doi.org/10.1007/s10834-019-09649-9

Lee, M. P., & Sabri, M. F. (2017). Review of financial vulnerability studies. *Archives of Business Research, 5*(2). https://doi.org/10.14738/abr.52.2784

Leventon, J., Fleskens, L., Claringbould, H., Schwilch, G., & Hessel, R. (2016). An applied methodology for stakeholder identification in transdisciplinary research. *Sustainability Science*, *11*(5), 763–775. https://doi.org/10.1007/s11625-016-0385-1

Lusardi, A., Hasler, A., & Yakoboski, P. J. (2021). Building up financial literacy and financial resilience. *Mind and Society*, *20*(2), 181–187. https://doi.org/10.1007/s11299-020-00246-0

Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, *52*(1), 5–44. https://doi.org/10.1257/jel.52.1.5

Lusardi, A., & Mitchell, O. S. (2023). The importance of financial literacy: Opening a new field. *Journal of Economic Perspectives, 37*(4), 137–154. https://doi.org/10.1257/jep.37.4.137

Lusardi, A., Mitchell, O. S., & Oggero, N. (2020). Debt and financial vulnerability on the verge of retirement. *Journal of Money, Credit and Banking*, *52*(5), 1005–1034. https://doi.org/10.1111/jmcb.12671

Lyons, A. C., & Kass-Hanna, J. (2021). Financial inclusion, financial literacy and economically vulnerable populations in the Middle East and North Africa. *Emerging Markets Finance and Trade*, *57*(9), 2699–2738. https://doi.org/10.1080/1540496X.2019.1598370

Mader, P. (2018). Contesting financial inclusion. *Development and Change, 49*(2), 461–483. https://onlinelibrary.wiley.com/doi/10.1111/dech.12368

Midões, C., & Seré, M. (2022). Living with reduced income: An analysis of household financial vulnerability under COVID-19. Social indicators research: An international and interdisciplinary. *Journal for Quality-of-Life Measurement*, *161*(5), 125–149. https://link.springer.com/article/10.1007/s11205-021-02811-7

Morgan, P. J., & Long, T. Q. (2020). Financial literacy, financial inclusion, and savings behavior in Laos. *Journal of Asian Economics*, *68.* https://shorturl.asia/KhE6D

Neaime, S., & Gaysset, I. (2018). Financial inclusion and stability in MENA: Evidence from poverty and inequality. *Finance Research Letters*, *24*, 230–237. https://doi.org/10.1016/j.frl.2017.09.007

Noerhidajati, S., Purwoko, A. B., Werdaningtyas, H., Kamil, A. I., & Dartanto, T. (2021). Household financial vulnerability in Indonesia: Measurement and determinants. *Economic Modelling*, *96,* 433–444. https://doi.org/10.1016/j.econmod.2020.03.028

O'Connor, G. E., Newmeyer, C. E., Wong, N. Y. C., Bayuk, J. B., Cook, L. A., Komarova, Y., Loibl, C., Lin Ong, L., & Warmath, D. (2019). Conceptualizing the multiple dimensions of consumer financial vulnerability. *Journal of Business Research*, *100*, 421–430. https://doi.org/10.1016/j.jbusres.2018.12.033

Organisation for Economic Co-operation and Development (OECD). (2022). *OECD/INFE toolkit for measuring financial literacy and financial inclusion 2022.* https://shorturl.asia/sLYyC

Omar, M. A., & Inaba, K. (2020). Does financial inclusion reduce poverty and income inequality in developing countries? A panel data analysis. *Journal of Economic Structures*, *9*(1), 1-25. https://shorturl.asia/w6ojG

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, *18*(4), 329–340. https://doi.org/10.1016/j.bir.2017.12.003

Ozili, P. K. (2021). Financial inclusion research around the world: A review. *Forum for Social Economics*, *50*(4), 457–479. https://doi.org/10.1080/07360932.2020.1715238

Patwardhan, A. (2018). Financial Inclusion in the digital age. In D. L. K. Chuen, & R. Deng (Eds). *Handbook of blockchain, digital finance, and inclusion, Volume 1: Cryptocurrency, fintech, insurtech, and regulation* (pp. 57–89). Elsevier. https://doi.org/10.1016/B978-0-12-810441-5.00004-X

Rekha, G., Rajamani, K., & Resmi, G. (2021). *Digital financial inclusion, economic freedom, financial development, and growth: Implications from a panel data analysis.* Asian Development Bank Institute.

Robb, C. A., Babiarz, P., Woodyard, A., & Seay, M. C. (2015). Bounded rationality and use of alternative financial services. *Journal of Consumer Affairs*, *49*(2), 407–435. https://doi.org/10.1111/joca.12071

Rodríguez-Pose, A., & Hardy, D. (2015). Addressing poverty and inequality in the rural economy from a global perspective. *Applied Geography, 61*(2), 11–23. https://doi.org/10.1016/j.apgeog.2015.02.005

Salignac, F., Muir, K., & Wong, J. (2016). Are you really financially excluded if you choose not to be included? Insights from social exclusion, resilience and ecological systems. *Journal of Social Policy*, *45*(2), 269–286. https://doi.org/10.1017/S0047279415000677

Santini, F. D. O., Ladeira, W. J., Mette, F. M. B. & Ponchio, M. C. (2019). The antecedents and consequences of financial literacy: A meta-analysis. *International Journal of Bank Marketing, 37*(6), 1462-1479. https://doi.org/10.1108/IJBM-10-2018-0281

Saraf, M., & Kayal, P. (2022). Role of digital financial inclusion in promoting economic growth and freedom. In D. Vukovic, M. Maiti, & G. Elena (Eds.). *Digitalization and the future of financial services: Innovation and impact of digital finance* (pp. 163-180). Springer Nature. https://doi.org/10.1007/978-3-031-11545-5_9

Sarma, M., & Pais, J. (2011). Financial inclusion and development. *Journal of International Development*, *23*(5), 613–628. https://doi.org/10.1002/jid.1698

Serido, J., Shim, S., & Tang, C. (2013). A developmental model of financial capability: A framework for promoting a successful transition to adulthood. *International Journal of Behavioral Development, 37*(4), 287–297. https://doi.org/10.1177/0165025413479476

Talitha, T., Firman, T., & Hudalah, D. (2020). Welcoming two decades of decentralization in Indonesia: A regional development perspective. *Territory, Politics, Governance*, 8(5), 690–708. https://doi.org/10.1080/21622671.2019.1601595

United Nations. (2018). *Financial inclusion: Technology, innovation, progress.*

Zaimovic, A., Torlakovic, A., Arnaut-Berilo, A., Zaimovic, T., Dedovic, L., & Nuhic Meskovic, M. (2023). Mapping financial literacy: A systematic literature review of determinants and recent trends. *Sustainability, 15*(12), 9358. https://doi.org/10.3390/su15129358