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Assessing Financial Well-Being in Free Trade Zone Regions: Evidence from Multi-Group Analysis

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ABSTRACT
This study examines the direct and indirect influence of digital financial literacy on financial well-being through financial health and personal financial management behavior as mediating variables, while also comparing the relationships across poor and vulnerable poor, lower-middle, middle, and upper-income groups. The study gathered data from 312 respondents, representing 7 regencies/cities in the Riau Islands Province and analyzed using the Partial Least Squares Multi Group Analysis (PLS-MGA). Digital financial literacy does not directly affect financial well-being. However, it positively influences financial health and personal financial management behavior, which subsequently improves financial well-being. Furthermore, the Multi-Group Analysis (MGA) reveals that most relationships are consistent across expenditure groups, except for the relationship between digital financial literacy and financial well-being. The lower-middle expenditure group shows a negative effect, whereas the poor and vulnerable group as well as the middle and upper group show positive effects. The unequal distribution of respondents across regions may reduce the generalizability of the findings. This study enriches digital financial literacy research by highlighting the mediating roles of financial health and personal financial management behavior. Policymakers should promote digital financial education programs that strengthen financial planning, saving, and financial management behavior, especially for lower-middle expenditure groups. Strengthening digital financial literacy and financial management practices may improve financial resilience, reduce financial vulnerability, and support long-term community welfare. This study provides evidence that digital financial literacy influences financial well-being indirectly through financial health and personal financial management behavior while uncovering differences among expenditure-based economic groups through multi-group analysis.

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1. Introduction

Indonesia holds the fourth position globally in terms of population size. Furthermore, the country has shown considerable economic progress in recent years. The government needs to prioritize policies aimed at enhancing the quality of life of its citizens, rather than focusing solely on

population size. These efforts can be implemented by strengthening the education and healthcare sectors, as well as by creating more employment opportunities to promote public welfare and sustainable economic growth. The poverty rate can be used as an indicator to represent the level of welfare of a country's population. The condition of poverty in Indonesia can be observed through data published by Badan Pusat Statistik Provinsi Kepulauan Riau (Badan Pusat Statistik Provinsi Kepulauan Riau, 2025).

Based on data published by Badan Pusat Statistik Provinsi Kepulauan Riau, In March 2025, the poverty rate in the Riau Islands Province was recorded at 4.44%. The poor population is classified based on the poverty line as the primary standard. The poverty threshold includes two elements: the food poverty threshold and the non-food poverty threshold. The food poverty threshold indicates the lowest amount of money spent on food necessary for a daily intake of 2,100 kilocalories per individual. At the same time, the non-food poverty threshold indicates the least amount of spending needed to meet fundamental non-food necessities, such as housing, clothing, education, healthcare, and other essential requirements.

Individuals classified as part of the low-income population generally lack the optimal capability to manage their finances effectively. The ability to handle financial instruments is a key factor in developing a well-functioning financial system and in achieving financial well-being (Chhillar et al., 2025). Individuals are considered to have attained financial well-being when they are able to live comfortably without experiencing concerns about their financial situation. Furthermore, Manurung et al. (Manurung et al., 2025) emphasize that household welfare should not be assessed solely based on income levels, but also on the actual capacity of households to manage their resources efficiently.

Along with modernization, Indonesia has experienced rapid growth in the financial technology (fintech) industry, ranking second after China (Nurkholik, 2023). The emergence of digital financial services has simplified the way people manage their finances. These services, which enable automated savings, scheduled deposits, and monitoring of financial goals, have been shown to encourage individuals' saving behavior and support the accumulation of emergency funds, long-term financial stability, and asset growth (Abdallah et al., 2024). However, Marheni et al. (Marheni et al., 2025) found that financial literacy does not consistently affect the decision to use financial services.

Financial well-being begins with effective financial management practices. When financial management is supported by strong digital financial literacy, individuals are more likely to achieve better financial outcomes. Conversely, limited financial literacy may lead to inefficient use of financial services, which can weaken personal financial management and ultimately hinder the achievement of financial well-being. Mawadah and Sumiati (Mawadah & Sumiati, 2024) state that financial health, which involves effective financial management and the assurance of future financial security, plays an essential role in enhancing financial well-being.

Several studies by Kuutol et al. (2024), Lone and Bhat (2024), Prieto et al. (2025), Sajuyigbe et al. (2024) have found that financial literacy has a significant positive effect on financial well-being. However, these studies mainly concentrate on financial literacy in a general context. Meanwhile, research conducted by Choung et al. (2023) and Nurkholik (2023) concludes that digital financial literacy also has a significant positive influence on financial well-being. In contrast, studies by Chhillar et al. (2025) conclude that digital financial literacy does not have a significant effect on financial well-being.

Given the inconsistencies in findings across previous studies and the limited research incorporating financial health as a mediating variable, this study introduces personal financial management behavior and Financial Health as mediators in the relationship between digital financial literacy and financial well-being. Furthermore, this study analyzes and compares the relationships among these variables across different economic categories specifically the poor and vulnerable poor (Group 1), the lower middle class (Group 2), and the middle and upper class (Group 3) by employing Multi Group Analysis (MGA).

Financial Literacy Theory proposed by Lusardi and Mitchell (2014) explains that individuals with financial knowledge are more capable of making sound decisions regarding saving, investing,

and consumption, which ultimately enhances their financial well-being. Although originally developed in a conventional financial context, its core elements knowledge, understanding, and decision making ability remain highly relevant in the digital financial environment. Behavioral Life Cycle Hypothesis emphasizes the concept of mental accounting, where individuals tend to allocate resources into separate "mental accounts", such as current consumption, precautionary savings, and long term investments. In the current digital landscape, higher digital financial literacy enhances the effectiveness of this mechanism through the use of financial applications and digital dashboards, which facilitate fund separation, automate transfers, and strengthen commitment to future-oriented accounts.

Digital Financial Literacy and Financial Well-Being

According to Nurkholik (2024), digital financial literacy equips individuals with the skills and judgment needed to manage digital financial activities, enabling them to make sound financial decisions and achieve financial well-being. Individuals with strong financial literacy possess the capability to manage their finances wisely and develop plans to secure future financial needs, ultimately leading to financial well-being (Lone & Bhat, 2024). Higher levels of financial literacy are therefore associated with a greater likelihood of achieving financial well-being. In the current era of digitalization, digital financial literacy has become a critical factor for society. Clarence and Pertiwi (2023) emphasize that understanding the use of digital financial services and asset management helps individuals protect their finances in online transactions and contributes to improved saving behavior.

Digital Financial Literacy and Personal Financial Management Behavior

Optimal financial balance can be maintained by adopting spending and saving habits aligned with efficient financial behavior (Jhonson et al., 2023). The ability to manage finances effectively is a key determinant of success, underscoring the importance of knowledge of financial management for all individuals Farida et al., (2021). Amid increasing financial digitalization, new skills and awareness of digital risks are required to manage daily financial activities effectively, including personal budgeting and short-term planning (2023). Growing Digital Financial Literacy is a primary driver of Financial Behavior (Gosal & Nainggolan, 2023). Furthermore, Wahyuni et al. (2025) state that the level of Financial Literacy significantly influences the quality of Personal Financial Management Behavior.

Digital Financial Literacy and Financial Health

Financial health refers to the overall condition of an individual's financial life, encompassing the ability to manage daily expenses, prepare for unexpected financial shocks, and make progress toward long-term goals (Manurung et al., 2025). It is fundamentally associated with the management of savings, debt, and approaches to financial planning (Nurlaily et al., 2022). In the digital era, digital financial literacy serves as a critical prerequisite for achieving and maintaining financial health, resulting in better results like enhanced savings and lower debt amounts. Empirical evidence from Nurlaily et al. (2022) indicates that higher levels of Digital Financial Literacy have a positive effect on an individual's Financial Health.

Personal Financial Management Behavior and Financial Well-Being

Effective personal financial management is positively associated with improved financial well-being and greater life satisfaction. Conversely, poor financial management is a significant contributor to depressive symptoms, with effects that may exceed those of low income and limited financial literacy (Chhillar et al., 2025). Financial Literacy provides individuals with crucial abilities and understanding related to saving habits, highlighting the significance of saving for financial stability and well-being, while supporting wise financial choices. Furthermore, personal financial management behavior has a substantial and long term impact on individuals' career trajectories,

as well as their long term financial stability, health, and overall financial well-being (Sabri et al., 2024).

Financial Health and Financial Well-Being

Weida et al. (2020) state that financial well-being can be assessed based on four key aspects: spending, saving, borrowing, and planning. Individuals who can manage these aspects effectively are considered to have good financial health. Prior studies conclude that financial health reflects more accurate financial behavior and planning, indicating a household's ability to remain financially "healthy". Mawadah and Sumiati (2024) find that the level of financial health among young adults has a significant impact on the achievement of financial well-being, which can be attributed to the implementation of effective financial management strategies.

Mediating Role of Personal Financial Management Behavior

The ability to manage finances is closely associated with financial management behavior. Accordingly, the influence of digital financial literacy on financial well-being depends on the individual's financial behavior. Individuals with strong digital competencies are more likely to effectively plan and manage their finances, as well as utilize relevant digital financial services, thereby enhancing their financial well-being (Chhillar et al., 2025). Thus, in the current digital era, financial well-being is more attainable for individuals who possess adequate digital financial literacy and have good personal financial management behavior. Rahayu et al. (2022) find that improvements in financial literacy can promote the achievement of financial well-being. Furthermore, studies by Gosal and Nainggolan (2023) highlight a positive relationship between personal financial behavior and financial well-being. Therefore, it can be concluded that personal financial behavior influences relationship between financial literacy to financial well-being.

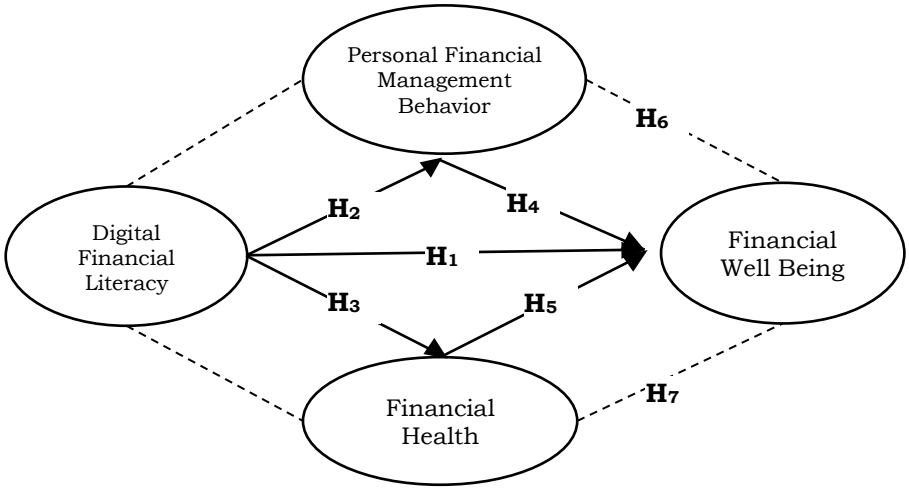


Figure 1. Research Framework

Mediating Role of Financial Health

Individuals need to optimize financial literacy in managing their finances to prevent unexpected expenses and adverse financial outcomes (Mawadah & Sumiati, 2024). Effective financial management positively influences financial health, that consequently results in attaining financial well-being over time. Prieto et al. (2025) highlight that financial well-being is multidimensional, encompassing individuals' satisfaction and confidence in three aspects: financial situation, financial health, and financial goals. Empirical evidence from Nurlaily et al. (2022) indicates a positive relationship between digital financial literacy and financial health. Moreover, Mawadah and Sumiati (2024) find that the level of financial health among young adults has a significant positive effect on the achievement of financial well-being.

2. Method

This research examines the causal relationship between digital financial literacy and financial well-being, with personal financial management behavior and financial health acting as mediating variables among individuals in the Riau Islands Province. A quantitative research method is utilized to investigate the connection among variables through numerical data processing and statistical analysis. Furthermore, a causal research design is adopted to assess the cause and effect relationships among the variables. Causal hypotheses represent scientific assumptions that explain the cause and effect relationships among variables and are formulated based on prior research findings.

Sample and Sampling Technique

The population of this research consists of individuals residing in the Riau Islands Province. Respondents who complete the questionnaire are categorized based on their monthly expenditure levels. Purposive sampling technique was used in this research, where respondents are selected according to predetermined criteria relevant to the research objectives. Research conducted by Kumar et al. (2023); She et al. (2021) with similar dependent variables used G*power software to determine the sample size. Therefore, the minimum sample for this study was determined using G*Power software. The significance level (α) was set at 0.05, the medium effect size (f^2) at 0.15, and the statistical power (1–β) at 0.80, following the guidelines proposed by Cohen (2013). According to these criteria, the least necessary sample size was 77 participants for each group with four predictors. Therefore, this study collected a total of 312 samples to conduct hypothesis testing.

Research Instrument

This study analyzes three types of variables: the independent variable (digital financial literacy), the dependent variable (financial well-being), and the mediating variables (financial health and personal financial management behavior). A five point Likert scale is used to measure all research instruments, ranging from 1 (strongly disagree) to 5 (strongly agree) (J. Hair et al., 2021). Data analysis is conducted using Structural Equation Modeling (SEM) with the Partial Least Squares (PLS) technique through Smart PLS 4.0, enabling the evaluation of the outer model, inner model, construct validity, reliability, and hypothesis testing. The measurement of each variable used in this study is shown in Table 1 below.

Table 1. Variable Measurement

No	Variable	Indicator	Statements	Sources
1	Digital Financial Literacy	DFL1	I understand digital banking products for managing my finances.	Nurkholik (2023)
		DFL2	I have a good understanding of digital banking products as well as other fintech products and services.	
		DFL3	I understand the process of submitting service complaints to digital financial service providers, as well as consumer rights and protection.	
		DFL4	I have extensive experience in utilizing digital banking products and other fintech products and services for financial management.	
		DFL5	I am aware of the potential financial risks of using fintech, such as interest rates, transaction fees, and the legality of fintech providers.	
		DFL6	I can manage my finances using digital platforms, including controlling transaction costs.	
		DFL7	I am skilled at managing my finances through digital platforms by evaluating expenses.	
		FH1	I am able to handle and manage financial bills well.	

No	Variable	Indicator	Statements	Sources
2	Financial Health	FH2	I regularly save for investment to build wealth in the future.	Herdjiono et al. (2023) ; Mawadah & Sumiati, (2024)
		FH3	I use money optimally to generate more income.	
		FH4	I prefer to make purchases using cash rather than incurring debt.	
3	Personal Financial Management Behavior	PFMB1	I allocate a specific amount of money to savings each month.	Chhillar et al. (2025)
		PFMB2	I save for long-term goals such as buying a car, education, a house, and so on.	
		PFMB3	I have an emergency fund and a retirement plan.	
		PFMB4	I have purchased investment products using digital platforms.	
		PFMB5	I already have sufficient health insurance coverage for my needs.	
4	Financial Well-Being	FWB1	Giving gifts for weddings, birthdays, or other events will not burden my financial condition this month.	Chhillar et al. (2025)
		FWB2	I am able to face unexpected large expenses.	
		FWB3	I am confident that my financial future is secure.	
		FWB4	I believe the money I have is sufficient to support my living needs.	
		FWB5	I am able to buy the things I want.	
		FWB6	I can enjoy life because of the way I manage my money.	
		FWB7	I believe the money I have can sustain me in the long term.	

3. Results

According to the evaluation of the questionnaire data shown in Table 2 below, the respondent profile in this study was largely dominated by females, representing 54% of the total respondents. Concerning educational history, most participants achieved senior high school or lower, with a total of 232 respondents, indicates that 74% of sample are graduates of the lowest level of education. Additionally, 43% of the sample are students which still in process learning about financial. In terms of place of residence, the highest proportion of respondents originated from Batam City, representing 51% of the total respondents who completed the questionnaire, while the remaining respondents came from various other cities or regencies.

Table 2. Respondent Demographics

Characteristic	Criteria	Frequency	Percentage
Gender	Female	169	54%
	Male	143	46%
Age	18 - 25 years	236	76%
	26 - 35 years	45	14%
	36 - 45 years	16	5%
	> 45 years	15	5%
Education	Senior high school or below	232	74%
	Undergraduate / Bachelor's Degree / Diploma	75	24%
	Postgraduate (Masters & Doctorate)	5	2%
Occupation	Employee	132	42%
	Student	134	43%
	Entrepreneur	34	11%
	Unemployed	12	4%
City/Regency of Residence	Tanjung pinang City	58	19%
	Batam City	160	51%
	Bintan Regency	3	1%
	Karimun Regency	79	25%
	Natuna Regency	3	1%

Characteristic	Criteria	Frequency	Percentage
	Anambas Island Regency	3	1%
	Lingga Regency	6	2%
Monthly Expenses	< 832.410	48	15%
	832.410 - 1.248.615	56	18%
	1.248.615 - 2.913.435	104	33%
	2.913.435 - 14.150.970	93	30%
	> 14.150.970	11	4%

As shown in Table 3 below, all variables show outer loading values above 0.60 and AVE values exceeding 0.50. Therefore, all research variables are considered valid and appropriate for further analysis. According to J. Hair et al. (2021), a variable is considered reliable when the values of Cronbach's alpha and composite reliability exceed 0.70. Based on these criteria, all variables analyzed in this study meet the required reliability requirement.

Table 3. Validity and Reliability Test Result

Variable	Indicator	Loading Factors	Cronbach's alpha	Composite reliability	Mean	AVE
Digital Financial Literacy	DFL1	0.702	0.884	0.910	4.272	0.591
	DFL2	0.767			3.926	
	DFL3	0.725			3.881	
	DFL4	0.802			3.753	
	DFL5	0.769			3.984	
	DFL6	0.789			4.090	
	DFL7	0.819			4.045	
Financial Health	FH1	0.778	0.759	0.846	3.946	0.581
	FH2	0.830			3.869	
	FH3	0.783			4.019	
	FH4	0.644			4.192	
Personal Financial Management Behavior	PFMB1	0.719	0.923	0.939	4.147	0.570
	PFMB2	0.814			3.946	
	PFMB3	0.807			3.689	
	PFMB4	0.743			3.599	
	PFMB5	0.686			3.612	
Financial Well-Being	FWB1	0.726	0.810	0.869	3.638	0.689
	FWB2	0.719			3.513	
	FWB3	0.857			3.760	
	FWB4	0.874			3.904	
	FWB5	0.874			3.910	
	FWB6	0.869			3.971	
	FWB7	0.870			3.795	

Discriminant validity was examined using the Heterotrait–Monotrait Ratio (HTMT) approach, that is utilized to assess if constructs are empirically separate from one another. According to (Hair et al. (2019),discriminant validity is confirsmed when the HTMT value between constructs is lower than 0.90. Table 4 below shows that all HTMT values are under the recommended threshold, verifying that each construct achieves sufficient discriminant validity and is clearly differentiated from the others.

Table 4. Heterotrait-monotrait ratio (HTMT)

Variable	DFL	FH	FWB	PFMB
Digital Financial Literacy				
Financial Health	0.593			
Financial Well-Being	0.480	0.793		
Personal Financial Management Behavior	0.657	0.865	0.770	

The direct effect analysis presented in Table 5 below indicates that most of the relationships among the variables are positive and statistically significant. The results show that digital financial literacy has a positive and significant impact on financial health, with a coefficient value of 0.516 and a p-value of 0.000 which is below 0.05, meaning that the hypothesis proposing an effect of

digital financial literacy on financial health is supported. Similarly, digital financial literacy also exerts a positive and significant influence on personal financial management behavior, as reflected by a coefficient value of 0.025 and a p-value of 0.000, thereby supporting this hypothesis as well. Moreover, financial health is found to positively and significantly affect financial well-being, with a coefficient value of 0.382 and a p-value of 0.000. In the same way, personal financial management behavior also shows a positive and significant relationship with financial well-being, indicated by a coefficient value of 0.389 and a p-value of 0.000. In contrast, the effect of digital financial literacy on financial well-being is not statistically significant, as shown by a p-value of 0.610, resulting in the rejection of the related hypothesis.

Table 5. Direct Effect Findings

	Coefficients	P values	Results	Hypothesis
DFL -> FH	0.516	0.000	Significant & Positive	Accepted
DFL -> FWB	0.025	0.610	Insignificant	Rejected
DFL -> PFMB	0.561	0.000	Significant & Positive	Accepted
FH -> FWB	0.382	0.000	Significant & Positive	Accepted
PFMB -> FWB	0.389	0.000	Significant & Positive	Accepted

Based on the indirect effect analysis shown in Table 6 below, both mediation paths in the research model are found to be statistically significant. The indirect relationship between digital financial literacy and financial well-being through financial health has a coefficient value of 0.197 with a p-value of 0.000, indicating that financial health is positive and significantly mediates the effect of digital financial literacy on financial well-being. Furthermore, the indirect effect of digital financial literacy on financial well-being through personal financial management behavior is also significant, as indicated by a coefficient value of 0.218 and a p-value of 0.000.

Table 6. Indirect Effect Findings

	Sample mean (M)	P values	Results	Hypothesis
DFL -> FH -> FWB	0.197	0.000	Mediation	Accepted
DFL -> PFMB -> FWB	0.218	0.000	Mediation	Accepted

As shown in Table 7 below, the p values are greater than 0.05, suggesting that the effects of digital financial literacy, personal financial management behavior, and financial health on financial well-being are relatively consistent across different groups until a significant difference was observed in the relationship between digital financial literacy and financial well-being in group 2. The test results indicate that the original value for group 2 is -0.159, while group 1 is 0.089 and group 3 is 0.260. This suggests that the effect of digital financial literacy on financial well-being is negative in group 2, whereas it is positive in group 1 and group 3. Therefore, a significant difference in the effect is observed between group 2 compared to group 1 and group 3.

Table 7. Multi-Group Analysis

	Original (Group 1)	Original (Group 2)	Original (Group 3)	2-tailed (Group 1 vs Group 2) p value	2-tailed (Group 2 vs Group 3) p value	2-tailed (Group 1 vs Group 3) p value
DFL -> FH	0.546	0.522	0.496	0.848	0.873	0.734
DFL -> FWB	0.089	-0.159	0.260	0.042	0.007	0.239
DFL -> PFMB	0.579	0.514	0.623	0.597	0.329	0.672
FH -> FWB	0.402	0.581	0.323	0.202	0.114	0.636
PFMB -> FWB	0.378	0.252	0.134	0.409	0.569	0.215

4. Discussion

Skills in managing finances via digital platforms, such as assessing expenses, highlight an individual's strong digital financial literacy. At the same time, individuals in the Riau Islands province do not have significant experience utilizing banking and other fintech services in their daily routines. Building wealth through investing contributes to individual's financial health. However, individuals in the Riau Islands province rarely invest. Individuals who save for long term goal such as buying a house, car, and educational expenses are the strongest signs of effective personal financial management behavior. The people of the Riau Islands have achieved this. However, they

rely mainly on cash savings rather than investments. Financial well-being can be seen in a person's ability to fulfill their needs and wants. However, many people in the Riau Islands still struggle to handle unexpected expenses, which means they still in financially limited situations.

The result of hypotheses testing show that digital financial literacy is not significant towards financial well-being, however the effect of digital financial literacy on financial well-being is positive significant indirectly through mediating variables, which is financial health and personal financial management behavior. Digital financial literacy has a significant positive impact on financial health and personal financial management behavior. In addition, financial health and personal financial management behavior also has a significant positive influence on financial well-being.

From the findings of this research, it may be concluded that Riau Islands Province with higher levels of digital financial literacy tend to have better financial health and improved personal financial management behavior. When an individual's financial condition improves and their financial management practices are effective, they are more likely to achieve financial capability, which is referred to financial well-being. Individuals must improve their skills in using digital platforms, such as mobile banking and other financial technologies, to manage their finances. They must also plan and save for long-term goals and invest in managing their finances to improve their financial health. Over time, this will create conditions where individuals can afford whatever they want without any concern, a process known as financial well-being.

Multi Group Analysis (MGA) results indicate that group 2 represents an intermediate category between the upper & middle group and the poor & vulnerable groups. This indicates that their socioeconomic condition lies in a transitional space, where they are no longer struggling to meet basic needs like the lower groups, yet have not reached the level of financial security and flexibility enjoyed by higher-income groups. As a result, their financial behavior and decision-making patterns may reflect a mix of caution and emerging consumption tendencies, influenced by both past constraints and current stability. This group shows a relatively stable standard of living, although it cannot be classified as wealthy. Their basic needs are adequately met, allowing them to maintain their daily lives. However, this sense of "sufficient" comfort reduces their financial awareness, as there is limited motivation to pursue a higher standard of living.

5. Conclusion

This study examined how digital financial literacy relates to financial well-being through financial health and personal financial management behavior among 312 respondents in the Riau Islands Province. The findings show no significant direct relationship between digital financial literacy and financial well-being, while both indirect pathways are positive and significant. These results highlight financial health and financial management behavior as links between digital financial knowledge and financial well-being.

The study contributes to research on digital financial literacy by showing that its relationship with financial well-being involves financial conditions and management practices. Multigroup analysis further identifies differences in the direct relationship across expenditure groups. The lower-middle expenditure group has a negative coefficient that differs significantly from those of the other two groups. However, this difference does not establish a significant negative relationship within that group or explain its underlying causes. For policymakers and financial education providers, the findings suggest combining digital financial education with practical support for budgeting, saving, debt management, and emergency planning. Programs should consider participants' financial circumstances and evaluate whether improved knowledge translates into sustainable financial practices and better financial outcomes.

These conclusions should be interpreted within the study's sampling limitations. Purposive sampling, uneven geographical coverage, and the predominance of younger respondents limit generalization to the wider population. The survey evidence warrants caution in drawing causal conclusions. Future research should use more representative samples and longitudinal designs, establish measurement comparability across groups, and examine mechanisms underlying expenditure-related differences, including financial constraints, access to suitable services, and financial risk exposure.

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