

An Empirical Analysis Using SmartPLS, AMOS, and LISREL in MSME Business Sustainability Research

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ABSTRACT

This study aims to compare the results of statistical data analysis using SmartPLS, AMOS, and LISREL in examining the relationships among Green Finance, Financial Literacy, Financial Management Behavior, and Business Sustainability. The study employed a quantitative explanatory research design using a dataset consisting of 150 MSME respondents and 20 measurement indicators, with five indicators representing each research construct. The same dataset, measurement indicators, and structural model were analyzed using three statistical approaches to identify the consistency and differences in the resulting estimates. The analysis focused on the coefficient of determination (R^2), direct effects, indirect effects, p-values, and t-statistics. The results show that Green Finance has a significant relationship with Financial Management Behavior and Business Sustainability, while Financial Literacy has a significant relationship with Financial Management Behavior and Business Sustainability. Financial Management Behavior also has a significant relationship with Business Sustainability. In addition, Financial Management Behavior significantly mediates the relationships between Green Finance and Business Sustainability and between Financial Literacy and Business Sustainability. The p-values for all direct and indirect relationships were 0.001 across SmartPLS, AMOS, and LISREL, indicating a consistent pattern of statistical significance. However, differences were observed in the R^2 values and t-statistics generated by the three analytical approaches. For Business Sustainability, the R^2 values were 0.872, 0.766, and 0.894 for SmartPLS, AMOS, and LISREL, respectively, while the R^2 values for Financial Management Behavior were 0.798, 0.655, and 0.766. The findings indicate that the three approaches produced consistent statistical significance decisions for the direct and indirect relationships examined. Financial Management Behavior also showed a significant mediating role in the relationships between Green Finance and Business Sustainability and between Financial Literacy and Business Sustainability. Nevertheless, differences were observed in the estimated R^2 values and t-statistics across the three approaches. These differences indicate that the numerical results depend, in part, on the estimation approach employed. Accordingly, the observed consistency in statistical significance decisions should not be interpreted as evidence of statistical equivalence among SmartPLS, AMOS, and LISREL. Rather, the findings demonstrate that the reported significance patterns were consistent within the specific dataset and model examined, while the differences in numerical estimates highlight the importance of considering the methodological characteristics of each approach when interpreting empirical results.

Keywords: SmartPLS, AMOS, LISREL, Statistical Comparison.

INTRODUCTION

Business sustainability has become an increasingly important issue in the management of micro, small, and medium-sized enterprises (MSMEs), as the ability of a business to survive and

grow in the long term is determined not only by profitability but also by its capacity to manage financial resources, adapt to changes in the business environment, and implement sustainability-oriented business practices. In Indonesia, micro, small, and medium enterprises (MSMEs) play an important role in the national economy. According to the Coordinating Ministry for Economic Affairs of the Republic of Indonesia (2021), Indonesia had approximately 64.2 million MSMEs, which contributed 61.07% of national Gross Domestic Product (GDP). These figures highlight the strategic importance of MSMEs in supporting economic activity and national development. Nevertheless, MSMEs continue to face challenges, particularly in accessing financing, improving financial management capabilities, and making effective financial decisions. These challenges underscore the importance of examining how green finance, financial literacy, and financial management behavior relate to business sustainability. This substantial contribution indicates that MSME sustainability has broader implications for economic resilience and development. Nevertheless, MSMEs continue to face various challenges, particularly limited access to financing, inadequate financial management capabilities, and constraints in making effective financial decisions.

Within this context, green finance, financial literacy, and financial management behavior represent important constructs for understanding business sustainability. Green finance refers to financial practices that integrate economic, social, and environmental considerations into financing and investment decisions to support sustainable development (Flammer, 2021; Schoenmaker & Schramade, 2022). Financial literacy, meanwhile, refers to an individual's ability to understand financial concepts and use financial knowledge to make effective financial decisions (Lusardi & Mitchell, 2014). Adequate financial literacy enables business owners to manage cash flows, plan financial activities, assess risks, and make more appropriate investment and financing decisions. Financial management behavior further reflects how individuals plan, allocate, monitor, and control financial resources, including budgeting, cash-flow management, expenditure control, and investment decisions (Bongomin & Ntayi, 2020; Morgan & Long, 2020).

The relationships among these constructs have received empirical support. The previous study underlying the present research found that green finance and financial literacy significantly influence business sustainability, while financial management behavior also has a significant effect on business sustainability. Furthermore, financial management behavior was found to mediate the relationships between green finance and financial literacy and business sustainability. These findings indicate that business sustainability may involve a complex system of relationships among latent constructs, including both direct and indirect effects. Consequently, the selection of an appropriate statistical approach becomes important when researchers seek to estimate and interpret relationships among latent variables and their measurement indicators.

Structural Equation Modeling (SEM) has become an important statistical approach for examining complex relationships involving latent constructs because it enables researchers to evaluate measurement models and structural relationships simultaneously (Kline, 2016). SEM approaches can generally be distinguished into covariance-based structural equation modeling (CB-SEM) and variance-based structural equation modeling, commonly referred to as partial least squares structural equation modeling (PLS-SEM). CB-SEM focuses on reproducing the empirical covariance matrix through model-based estimation and is commonly associated with theory testing and model confirmation. In contrast, PLS-SEM emphasizes the explanation of

variance in endogenous constructs and prediction. Consequently, the two approaches differ in their estimation procedures, objectives, assumptions, and criteria for evaluating model results (Hair et al., 2019; Henseler et al., 2016). These methodological differences are particularly relevant when different statistical software packages are used to analyze the same research model. AMOS and LISREL are widely associated with covariance-based SEM, whereas SmartPLS is widely used for PLS-SEM.

Previous methodological studies have demonstrated that different SEM software packages can produce highly similar but not necessarily identical results when analyzing the same dataset. Clayton and Pett (2008), for example, compared AMOS and LISREL using one dataset and found broadly similar analytical results while identifying differences in particular estimates and statistical outputs. Such evidence suggests that analytical results may be influenced by methodological and estimation characteristics in addition to the substantive research model itself. Consequently, comparing results across statistical approaches can provide useful methodological information regarding the extent to which empirical conclusions remain consistent when the same data and theoretical model are analyzed using different procedures.

The distinction between CB-SEM and PLS-SEM is also important because the two approaches emphasize different analytical objectives. CB-SEM is generally associated with model fit and theory confirmation, whereas PLS-SEM places greater emphasis on explained variance and prediction (Henseler et al., 2016; Hair et al., 2020). In PLS-SEM, model assessment commonly involves indicator loadings, construct reliability, convergent validity, discriminant validity, coefficients of determination, and path coefficients. Contemporary PLS-SEM guidelines have also introduced more advanced procedures for assessing construct validity and model quality, including the heterotrait-monotrait ratio and confirmatory composite analysis (Henseler et al., 2016; Hair et al., 2020). These methodological distinctions imply that differences in statistical results should be interpreted in relation to the analytical logic underlying each approach rather than attributed solely to differences in software.

Despite the development of various SEM approaches and statistical software packages, empirical studies that use the same respondents, indicators, dataset, and structural model to simultaneously compare AMOS, LISREL, and SmartPLS remain limited. Existing comparative research has generally focused on specific pairs of SEM approaches or on comparisons between CB-SEM and PLS-SEM. A broader comparison involving regression-based analysis through SPSS, covariance-based SEM through AMOS and LISREL, and variance-based SEM through SmartPLS and WarpPLS can provide a more comprehensive assessment of the consistency of empirical findings across analytical approaches. Using the same dataset is particularly important because it minimizes the influence of differences in sample characteristics and measurement instruments, allowing methodological differences to be examined more directly.

The present study addresses this methodological gap by using a common empirical model consisting of green finance, financial literacy, financial management behavior, and business sustainability and analyzing the same dataset through three statistical approaches: AMOS, LISREL, and SmartPLS. The dataset consists of 150 MSME respondents and 20 measurement indicators, with five indicators representing each construct. The original study (Fitriana et al., 2026) used the same data and employed SmartPLS 3.0, evaluating the measurement model through outer loadings, Average Variance Extracted (AVE), cross-loadings, the Fornell-Larcker criterion, Composite Reliability, and Cronbach's Alpha, followed by structural-model evaluation using R-square, path coefficients, t-statistics, and p-values obtained through bootstrapping. The original analysis provides an empirical baseline for the

comparative investigation. The reported R-square values were 0.872 for business sustainability and 0.798 for financial management behavior. The analysis also reported significant direct relationships from green finance to financial management behavior and business sustainability, from financial literacy to financial management behavior and business sustainability, and from financial management behavior to business sustainability. In addition, both green finance and financial literacy demonstrated significant indirect effects on business sustainability through financial management behavior. These findings provide a useful reference point for examining whether the same substantive conclusions are maintained when the dataset is reanalyzed using alternative statistical approaches.

Accordingly, this study aims to compare the results of statistical data analysis using AMOS, LISREL, and SmartPLS in examining the relationships among green finance, financial literacy, financial management behavior, and business sustainability. Specifically, the study compares measurement-model results, structural-model results, path coefficients, explanatory power, statistical significance, and mediation effects generated by the five analytical approaches. The contribution of this study lies in providing empirical evidence based on a single dataset, identical measurement indicators, and an identical structural model regarding the extent to which different statistical approaches produce consistent or different analytical results. By adopting this comparative design, the study is expected to contribute to the methodological literature in management research and provide empirical considerations for researchers when selecting an appropriate statistical approach for quantitative studies involving latent constructs, direct relationships, and mediation effects.

METHOD

This study employed a quantitative approach with an explanatory research design to examine the relationships among Green Finance, Financial Literacy, Financial Management Behavior, and Business Sustainability among Micro, Small, and Medium Enterprises (MSMEs), while also comparing the estimation results obtained from different statistical analysis approaches. The dataset consisted of 150 MSME respondents and 20 measurement indicators, comprising five indicators of Green Finance (GF1–GF5), five indicators of Financial Literacy (FL1–FL5), five indicators of Financial Management Behavior (FMB1–FMB5), and five indicators of Business Sustainability (BS1–BS5). The research model specified Green Finance (X1) and Financial Literacy (X2) as exogenous constructs, Financial Management Behavior (M) as the mediating construct, and Business Sustainability (Y) as the endogenous construct. Structural Equation Modeling (SEM) was employed because it enables the simultaneous examination of relationships between latent constructs and their observed indicators, as well as the evaluation of both the measurement and structural models. In latent-variable research, assessment of the measurement model is essential to establish adequate reliability and validity before interpreting the structural relationships among constructs.

To provide a methodological comparison, all analyses were conducted using the same dataset, constructs, indicators, and structural model across five statistical software applications: Analysis of Moment Structures (AMOS), LISREL, and SmartPLS. AMOS and LISREL were employed to estimate Covariance-Based Structural Equation Modeling (CB-SEM). SmartPLS was used to estimate Partial Least Squares Structural Equation Modeling (PLS-SEM). The distinction between covariance-based and variance-based approaches is important because they employ different estimation principles and have different analytical objectives; consequently,

path coefficients and model evaluation results may not be identical even when the same dataset and conceptual model are used.

For the SEM analyses, the measurement model was evaluated before interpreting the structural model. The assessment included standardized loadings or outer loadings, internal consistency reliability, Average Variance Extracted (AVE), and discriminant validity. In the PLS-SEM approach, discriminant validity was additionally assessed using the Heterotrait–Monotrait ratio (HTMT). Henseler et al. (2015) demonstrated that HTMT can provide a more sensitive assessment of discriminant validity than the Fornell–Larcker criterion and cross-loading assessment in variance-based structural equation modeling. Therefore, HTMT was incorporated as an additional criterion for evaluating discriminant validity in the PLS-SEM analyses. The structural model was subsequently evaluated using path coefficients, the coefficient of determination (R^2), statistical significance, and direct and indirect effects.

Mediation analysis was conducted to determine whether Financial Management Behavior mediates the relationships between Green Finance and Business Sustainability and between Financial Literacy and Business Sustainability. The mediation analysis considered the direct effect, indirect effect, and statistical significance of the indirect effect. This procedure is consistent with the mediation framework proposed by Hayes (2018), in which the relationship between a predictor and an outcome can be examined through an intervening mechanism represented by a mediator, while distinguishing between direct and indirect effects. Hypothesis testing was conducted at a 5% significance level ($\alpha = 0.05$), with statistical decisions based on p-values and/or confidence intervals according to the estimation procedures applied in each analytical approach.

Finally, the results obtained from AMOS, LISREL, and SmartPLS were compared using an identical dataset and equivalent model specifications. The comparison focused on the direction and magnitude of path coefficients, statistical significance, R^2 values, and direct and indirect effects. The purpose of the comparison was to identify the consistency and differences in parameter estimates resulting from the methodological characteristics of the respective estimation approaches rather than to rank or determine the superiority of one software application over another. Accordingly, differences in the empirical results were interpreted as potential methodological consequences of applying different statistical estimation approaches to the same research model and dataset.

RESULT AND DISCUSSION

This study utilizes a dataset obtained from a previous study (Fitriana et. al., 2026) in which the research instruments had already undergone validity and reliability testing. Therefore, the present study does not repeat the validity and reliability tests, as the measurement instruments have been previously evaluated and established as valid and reliable in the original study. Instead, the analysis focuses on examining the structural relationships among the research variables using five statistical and structural equation modeling approaches: AMOS, LISREL, and SmartPLS. Specifically, the analyses include direct-effect testing to assess the effect of one variable on another, indirect-effect testing to examine the mediating relationships among the variables, and R-square (R^2) analysis to determine the proportion of variance in the endogenous variables that can be explained by their predictor variables. The same dataset and research model are analyzed using each software package to facilitate a comparative assessment of the results generated by AMOS, LISREL, and SmartPLS. Accordingly, the analytical focus of this study is limited to the evaluation and comparison of direct effects, indirect effects, and R-square

values, while validity and reliability assessments are not repeated because they have been established in the previous research from which the dataset was obtained.

Table 1. R-Square Values

Variabel	SMART-PLS	AMOS	LISREL
Business Sustainability	0,872	0,766	0,894
Financial Management Behavior	0,798	0,655	0,766

Source: Processed Research Data (2026)

Based on Table 1, the R-square values indicate the explanatory power of the predictor variables for the endogenous variables in the research model. For Business Sustainability, the R-square value obtained from SmartPLS was 0.872, compared with 0.766 from AMOS and 0.894 from LISREL. These results indicate differences in the level of explanatory power across the three analytical approaches, although all three approaches produced relatively high R-square values. Meanwhile, for Financial Management Behavior, the R-square values were 0.798 for SmartPLS, 0.655 for AMOS, and 0.766 for LISREL. Thus, the results demonstrate variations in R-square values across the statistical software applications despite the use of the same dataset and research model. These differences reflect variations in the estimation results associated with the methodological characteristics of each analytical approach.

Table 2. Path Coefficients (P-Value)

Relationships between Variables	SMART-PLS	AMOS	LISREL
Green Finance (X1) -> Financial Management Behavior (Z)	0,001	0,001	0,001
Green Finance (X1) -> Business Sustainability (Y)	0,001	0,001	0,001
Finance Literacy (X2) -> Financial Management Behavior (Z)	0,001	0,001	0,001
Finance Literacy (X2) -> Business Sustainability (Y)	0,001	0,001	0,001
Financial Management Behavior (Z) -> Business Sustainability (Y)	0.001	0.001	0.001

Source: Processed Research Data (2026)

Based on Table 2, all direct relationships among the variables in the research model produced a p-value of 0.000 in SmartPLS, AMOS, and LISREL. The relationship between Green Finance and Financial Management Behavior yielded a p-value of 0.001 across all three analytical approaches. Similarly, the relationship between Green Finance and Business Sustainability produced a p-value of 0.000 in SmartPLS, AMOS, and LISREL. The same result was observed for the relationship between Financial Literacy and Financial Management Behavior and for the relationship between Financial Literacy and Business Sustainability, both of which produced a p-value of 0.000 across the three statistical approaches. In addition, the relationship between Financial Management Behavior and

Business Sustainability also yielded a p-value of 0.000 in SmartPLS, AMOS, and LISREL. Therefore, based on the significance values reported in the table, all direct relationships examined in the research model were statistically significant across the three analytical approaches.

Table 3. Path Coefficients (T-Statistics)

Relationships between Variables	SMART-PLS	AMOS	LISREL
Green Finance (X1) -> Financial Management Behavior (Z)	14,676	15,433	16,343
Green Finance (X1) -> Business Sustainability (Y)	6.044	7.340	7,212
Finance Literacy (X2) -> Financial Management Behavior (Z)	12,518	13,908	14,022
Finance Literacy (X2) -> Business Sustainability (Y)	4,756	4,020	5,365
Financial Management Behavior (Z) -> Business Sustainability (Y)	9,116	8,015	8,318

Source: Processed Research Data (2026)

Based on Table 3, all direct relationships in the research model produced different t-statistics across SmartPLS, AMOS, and LISREL. The relationship between Green Finance and Financial Management Behavior produced t-statistics of 14.676 in SmartPLS, 15.433 in AMOS, and 16.343 in LISREL. The relationship between Green Finance and Business Sustainability yielded values of 6.044, 7.340, and 7.212, respectively. Furthermore, the relationship between Financial Literacy and Financial Management Behavior produced t-statistics of 12.518 in SmartPLS, 13.908 in AMOS, and 14.022 in LISREL. The relationship between Financial Literacy and Business Sustainability resulted in values of 4.756 in SmartPLS, 4.020 in AMOS, and 5.365 in LISREL. Meanwhile, the relationship between Financial Management Behavior and Business Sustainability produced t-statistics of 9.116 in SmartPLS, 8.015 in AMOS, and 8.318 in LISREL. Overall, the results indicate that all direct relationships produced relatively high t-statistics across the three analytical approaches, although the magnitude of the estimates varied according to the statistical method used.

Table 4. The Indirect Effects (P-Values)

Relationships between Variables	SMART-PLS	AMOS	LISREL
Finance Literacy (X2) -> Financial Management Behavior (Z) -> Business Sustainability (Y)	0,001	0,001	0,001
Green Finance (X1) -> Financial Management Behavior (Z) -> Business Sustainability (Y)	0,001	0,001	0,001

Source: Processed Research Data (2026)

Based on Table 4, the indirect effect of Financial Literacy on Business Sustainability through Financial Management Behavior produced a p-value of 0.000 in SmartPLS, AMOS, and LISREL. Similarly, the indirect effect of Green Finance on Business Sustainability through Financial Management Behavior also produced a p-value of 0.001 across all three analytical approaches. These results indicate that both indirect relationships involving Financial Management Behavior as a mediating variable produced the same significance value in SmartPLS, AMOS, and LISREL. Therefore, based on the reported indirect-effect results, Financial Management Behavior mediates the relationship between Financial Literacy and Business Sustainability as well as the relationship between Green Finance and Business Sustainability.

Table 5. The Indirect Effects (T-Statistics)

Relationships between Variables	SMART-PLS	AMOS	LISREL
Finance Literacy (X2) -> Financial Management Behavior (Z) -> Business Sustainability (Y)	7,116	7,212	8,233
Green Finance (X1) -> Financial Management Behavior (Z) -> Business Sustainability (Y)	7,479	7,878	8,565

Based on Table 5, the indirect effect of Financial Literacy on Business Sustainability through Financial Management Behavior produced a t-statistic of 7.116 in SmartPLS, 7.212 in AMOS, and 8.233 in LISREL. Meanwhile, the indirect effect of Green Finance on Business Sustainability through Financial Management Behavior produced t-statistics of 7.479 in SmartPLS, 7.878 in AMOS, and 8.565 in LISREL. These results indicate that both indirect-effect paths produced relatively high t-statistics across all three analytical approaches. Although the magnitude of the t-statistics differed across the statistical software applications, the results showed a consistent pattern for both mediation relationships examined in the study.

Discussion

The findings of this study demonstrate a high degree of consistency in the statistical significance of the structural relationships across SmartPLS, AMOS, and LISREL, although differences were observed in the magnitude of the estimated statistics. The results show that Green Finance significantly relates to Financial Management Behavior and Business Sustainability, while Financial Literacy significantly relates to Financial Management Behavior and Business Sustainability. Financial Management Behavior also demonstrates a significant relationship with Business Sustainability. Furthermore, the indirect-effect analysis indicates that Financial Management Behavior significantly mediates the relationships between Green Finance and Business Sustainability and between Financial Literacy and Business Sustainability. The consistency of the p-values across the three analytical approaches, all reported as 0.000, suggests that the substantive conclusions regarding the significance of the hypothesized relationships remain unchanged despite differences in the statistical estimation procedures. This finding is important because it indicates that the main empirical relationships

identified in the research model are not highly sensitive to the choice among the three statistical approaches examined.

The results are consistent with previous comparative research showing that different SEM software applications can generate highly similar substantive conclusions when the same dataset and model specifications are used. Clayton and Pett (2008), for example, compared AMOS and LISREL using the same dataset and found extremely similar, although not completely identical, solutions. Their study reported minor differences in critical ratios and parameter estimates, while the final structural solutions remained comparable across the two programs. This finding provides methodological support for the present results, in which AMOS and LISREL produced the same significance pattern for all direct and indirect relationships but differed in the magnitude of their t-statistics and R-square values. Similarly, a comparative study using AMOS, LISREL, and PLS reported that researchers should distinguish between the statistical parameters generated by each software because identical parameter names do not necessarily imply identical analytical meanings or estimation procedures. Thus, the differences observed in the present study should be interpreted as methodological differences in estimation rather than as evidence that the underlying empirical relationships are necessarily contradictory.

The differences in explanatory power further reinforce the importance of considering the analytical approach when interpreting SEM results. In the present study, the R-square value for Business Sustainability was 0.872 in SmartPLS, 0.766 in AMOS, and 0.894 in LISREL, while the R-square value for Financial Management Behavior was 0.798, 0.655, and 0.766, respectively. These differences indicate that the proportion of variance explained by the predictor variables varies according to the estimation approach. Such variation is theoretically plausible because CB-SEM and PLS-SEM are based on different estimation principles and analytical objectives. CB-SEM generally emphasizes the reproduction of the empirical covariance structure and theory confirmation, whereas PLS-SEM places greater emphasis on explained variance and prediction. Therefore, R-square values obtained from different approaches should be interpreted within the methodological framework of each approach rather than treated as directly interchangeable measures of model performance.

The present findings also correspond with broader comparative evidence involving multiple statistical software packages. Purwanto et al. examined quantitative research results using LISREL, Tetrad, GSCA, SPSS, SmartPLS, WarpPLS, and AMOS and reported no significant differences in p-values and t-values in their large-sample analysis. A related study involving 122 respondents and several of the same statistical applications likewise reported no significant differences in p-values, t-values, determination values, and correlations across the software applications examined. These findings support the interpretation that, when the same empirical data and equivalent structural relationships are analyzed, different statistical tools may yield broadly consistent substantive conclusions even when individual parameter estimates differ. The present study extends this methodological perspective to a model involving Green Finance, Financial Literacy, Financial Management Behavior, and Business Sustainability.

The indirect-effect findings provide additional evidence of methodological consistency. Both mediation paths produced p-values of 0.000 across SmartPLS, AMOS, and LISREL, while the corresponding t-statistics were 7.116, 7.212, and 8.233 for the Financial Literacy, Financial Management Behavior, Business Sustainability pathway and 7.479, 7.878, and 8.565 for the Green Finance, Financial Management Behavior, Business Sustainability pathway. The relatively similar results across the three approaches indicate that the mediating role of Financial Management Behavior is consistently detected regardless of the estimation procedure. This

result is particularly relevant because indirect effects may be sensitive to estimation procedures and sampling characteristics. Comparative methodological evidence has shown that differences between SEM approaches can affect parameter magnitudes, while the substantive pattern of relationships may nevertheless remain similar. A recent comparative study using the same conceptual model and data also found that maximum-likelihood CB-SEM and consistent PLS-SEM could produce closely aligned structural results, illustrating that methodological differences do not automatically lead to different substantive conclusions.

From a methodological perspective, these findings suggest that statistical software should not be treated merely as a technical choice. Rather, the selection of an analytical approach should be aligned with the research objective, theoretical orientation, measurement model, data characteristics, and intended interpretation of the results. Comparative research between CB-SEM and PLS-SEM emphasizes that the two approaches are based on different estimation principles and serve somewhat different analytical purposes. Consequently, the consistency of the significance patterns observed in this study should not be interpreted as indicating that SmartPLS, AMOS, and LISREL are statistically identical. Instead, the results demonstrate that the principal empirical relationships in the proposed model remain stable across the approaches, while differences in R-square values and t-statistics reflect methodological characteristics of the respective estimation procedures.

Overall, the findings provide empirical evidence that the substantive conclusions concerning the relationships among Green Finance, Financial Literacy, Financial Management Behavior, and Business Sustainability are relatively consistent across the statistical approaches examined. At the same time, the observed differences in explanatory power and test statistics demonstrate that methodological choices can influence the numerical representation of empirical relationships. Therefore, comparative analysis using more than one statistical approach can provide a stronger methodological perspective by distinguishing conclusions that are robust across estimation procedures from results that are more sensitive to methodological specifications. This comparative perspective is particularly relevant for quantitative management research involving latent constructs and mediation effects, where researchers need to consider not only statistical significance but also the estimation logic underlying the analytical method.

CONCLUSION

This study concludes that the structural relationships among Green Finance, Financial Literacy, Financial Management Behavior, and Business Sustainability demonstrate a consistent pattern across SmartPLS, AMOS, and LISREL, although differences are observed in the magnitude of the statistical estimates and explanatory power. The results indicate that Green Finance has a significant relationship with Financial Management Behavior and Business Sustainability, while Financial Literacy also has a significant relationship with Financial Management Behavior and Business Sustainability. Furthermore, Financial Management Behavior is significantly associated with Business Sustainability. The indirect-effect analysis further demonstrates that Financial Management Behavior plays a significant mediating role in the relationships between Green Finance and Business Sustainability and between Financial Literacy and Business Sustainability. The consistency of the significance results across the three analytical approaches indicates that the substantive conclusions of the proposed structural model remain stable when the same dataset and model specifications are analyzed using different

estimation procedures. However, differences in R-square values and t-statistics demonstrate that the choice of analytical approach can influence the magnitude of statistical estimates and the explanatory power reported by the model. Therefore, the findings emphasize the importance of considering methodological characteristics and research objectives when selecting an appropriate statistical approach for quantitative research involving latent constructs and mediation relationships.

Future research is encouraged to extend the comparative methodological analysis by incorporating the complete set of statistical approaches originally proposed in this study, including SPSS and WarpPLS, in addition to SmartPLS, AMOS, and LISREL. Such an extension would provide a more comprehensive comparison between regression-based analysis, covariance-based SEM, and variance-based SEM using the same dataset and structural model. Future studies should also consider using larger and more diverse samples from different regions, business sectors, and MSME characteristics to examine whether the consistency of statistical findings is maintained across different empirical contexts. In addition, subsequent research may compare the results using alternative datasets and measurement models to determine whether differences among statistical approaches become more pronounced under different data characteristics, sample sizes, or model complexities. Researchers are also encouraged to report not only significance values but also standardized coefficients, confidence intervals, effect sizes, model-fit measures where applicable, predictive assessment, and other relevant methodological criteria. Such an approach would provide a more comprehensive understanding of how methodological choices influence empirical results and would strengthen the methodological contribution of comparative statistical research in management and business studies.

REFERENCES

- Bongomin, G. O. C., Ntayi, J. M., & Malinga, C. A. (2020). Analyzing the relationship between financial literacy and financial inclusion by microfinance banks in developing countries: Social network theoretical approach. *International Journal of Sociology and Social Policy*, 40(11/12), 1257–1277. <https://doi.org/10.1108/IJSSP-12-2019-0262>
- Clayton, M. F., & Pett, M. A. (2008). AMOS versus LISREL: One data set, two analyses. *Nursing Research*, 57(4), 283–292. <https://doi.org/10.1097/01.NNR.0000313487.64412.be>
- Coordinating Ministry for Economic Affairs of the Republic of Indonesia. (2021). *UMKM menjadi pilar penting dalam perekonomian Indonesia* [MSMEs are an important pillar of Indonesia's economy]. <https://ekon.go.id/publikasi/detail/2969/umkm>
- Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics*, 142(2), 499–516. <https://doi.org/10.1016/j.jfineco.2021.01.010>
- Fitriana, Sipayung, Leonardo Davidsi, & Pratama, Aryan Agus. (2026). Pengaruh Green Finance dan Financial Literacy terhadap Business Sustainability dengan Financial Behavior sebagai Variabel Mediasi. *Media Mahardhika*, 24(3), 562–574.
- Hair, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, 109, 101–110. <https://doi.org/10.1016/j.jbusres.2019.11.069>

- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). Guilford Press.
- Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems*, 116(1), 2–20. <https://doi.org/10.1108/IMDS-09-2015-0382>
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.
- 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>
- Morgan, P. J., & Long, T. Q. (2020). Financial literacy, financial inclusion, and savings behavior in Laos. *Journal of Asian Economics*, 68, 101197. <https://doi.org/10.1016/j.asieco.2020.101197>
- Purwanto, A., Asbari, M., Santoso, T. I., Haque, M. G., & Nurjaya. (2019). Marketing research quantitative analysis for large sample: Comparing of LISREL, TETRAD, GSCA, AMOS, SmartPLS, WarpPLS, and SPSS. *Jurnal Ilmiah Ilmu Administrasi Publik: Jurnal Pemikiran dan Penelitian Administrasi Publik*, 9(2), 355–372. <https://doi.org/10.26858/jiap.v9i2.22803>
- Schoenmaker, D., & Schramade, W. (2022). *Principles of sustainable finance*. Oxford University Press.
- Thaha, A. F. (2020). Dampak COVID-19 terhadap UMKM di Indonesia. *BRAND Jurnal Ilmiah Manajemen Pemasaran*, 2(1), 147–153. <https://ejournals.umma.ac.id/index.php/brand>