

The Effect of Business Environment, Business Capital, and Innovation Strategy on the Competitiveness of Waste-Based MSMEs in Sidoarjo

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Abstract

Micro, small, and medium enterprises (MSMEs) that convert household waste into marketable products occupy a strategic position in Indonesia's circular economy agenda, yet they remain among the least competitive segments of the national business population. This study examines the simultaneous and partial effects of the business environment, business capital, and innovation strategy on MSME competitiveness in Sidoarjo, East Java. An explanatory quantitative design was applied. Data were collected between April and August 2025 through structured questionnaires and interviews with owner-managers of waste-based MSMEs. Of 135 questionnaires distributed, 120 were returned complete and analysable, an effective response rate of 88.9 per cent. Respondents were selected purposively on two criteria: the enterprise uses organic or inorganic household waste as a production input, and the enterprise has operated for more than one year. All constructs were measured on five-point Likert scales and analysed using multiple linear regression (ordinary least squares) in SPSS after validity, reliability, and classical assumption testing. The results show that all three predictors exert positive and statistically significant effects on competitiveness: innovation strategy ($\beta = 0.409$; $p < 0.001$), business environment ($\beta = 0.314$; $p < 0.001$), and business capital ($\beta = 0.246$; $p = 0.001$). Jointly the three variables explain 55.8 per cent of the variance in competitiveness ($F(3, 116) = 48.73$; $p < 0.001$; adjusted $R^2 = 0.546$). Innovation strategy is the dominant determinant, indicating that capability-building interventions deliver greater competitive leverage than financing support alone. The study extends the resource-based view to waste-processing microenterprises and provides evidence-based guidance for local MSME development policy.

Keywords:

Business environment; Business capital; Innovation strategy; MSME competitiveness; Circular economy.

1. INTRODUCTION

Micro, small, and medium enterprises (MSMEs) constitute the structural backbone of the Indonesian economy. National statistics reported by the Ministry of Cooperatives and SMEs record approximately 64.2 million business units contributing 61.07 per cent of gross domestic product, equivalent to IDR 8,574 trillion, while the Ministry of Finance (2021) notes that the sector absorbs about 97 per cent of the national workforce and attracts 60.42 per cent of total investment. In Sidoarjo Regency, one of the densest industrial and trading corridors in East Java, MSMEs are the principal source of household income and local employment. Their operating conditions, however, have become markedly more demanding: competition has intensified, technology cycles have shortened, and consumer expectations have shifted towards products that are both differentiated and environmentally responsible (Muslih & Erlando, 2019).

A second, less frequently examined pressure arises from the way Indonesian municipalities manage household waste. Waste handling remains partial, and the processing technology available to local communities is largely conventional, so that unprocessed waste becomes an environmental pollutant. Applying the reduce-reuse-recycle principle, a growing number of MSMEs have begun to treat household waste as a production input, converting organic and inorganic residues into handicrafts, food products, and other saleable goods (Ji et al., 2018). These waste-based enterprises sit at the intersection of two policy priorities, MSME development and the circular economy, yet their competitive dynamics are poorly documented.

The competitiveness of MSMEs is conventionally explained by a combination of internal and external determinants. From the internal side, the resource-based view holds that sustained competitive advantage originates in resources and capabilities that are valuable, rare, and difficult to imitate (Barney, 1991), and that the capacity to reconfigure those resources in changing markets constitutes a dynamic capability (Teece et al., 1997). Innovation is the clearest expression of such a capability; Schumpeter (1934) treated new combinations of resources as the engine of enterprise renewal, and contemporary evidence confirms that innovation raises both economic and environmental performance in small firms (Rinawiyanti, 2016; Sanchez-Henriquez & Pavez, 2021). Business capital, the second internal determinant, enables investment in equipment, product development, and market expansion. From the external side, Porter (1990) argued that the competitive position of firms is conditioned by the quality of the environment in which they operate. Empirically, Akhyar et al. (2021) found that regulation, infrastructure, and market access are decisive determinants of MSME competitiveness in Aceh Province, while Javeed et al. (2022) showed that environmental strategy shapes the green innovation behaviour of firms.

Despite this accumulated evidence, three gaps remain. First, prior studies have tended to examine determinants in isolation; Manggu et al. (2024), for example, combined environment and capital with marketing creativity rather than with a comprehensive innovation strategy, so that the relative weight of each determinant in a single estimated model is still unclear. Second, existing Indonesian evidence is concentrated in Aceh, North Sumatra, and West Kalimantan, and no comparable estimation exists for Sidoarjo Regency, whose enterprise structure and institutional support differ substantially. Third, and most importantly, almost no study has modelled competitiveness for the specific population of MSMEs that use household waste as a raw material, even though the sustainability literature identifies this group as strategically important (Broccardo et al., 2023; Nuraini et al., 2024). Accordingly, this study addresses three research questions: how does the business environment affect MSME competitiveness in Sidoarjo; how does business capital affect it; and how does innovation strategy affect it?

The objective of the research is therefore to estimate, simultaneously and partially, the effects of the business environment, business capital, and innovation strategy on the competitiveness of waste-based MSMEs in Sidoarjo Regency, and to establish which determinant exerts the strongest influence. Drawing on the theoretical and empirical arguments above, three hypotheses are proposed:

H1: The business environment has a significant positive effect on MSME competitiveness in Sidoarjo.

H2: Business capital has a significant positive effect on MSME competitiveness in Sidoarjo.

H3: Innovation strategy has a significant positive effect on MSME competitiveness in Sidoarjo.

The relationships tested are summarised in the research model presented in Figure 1.

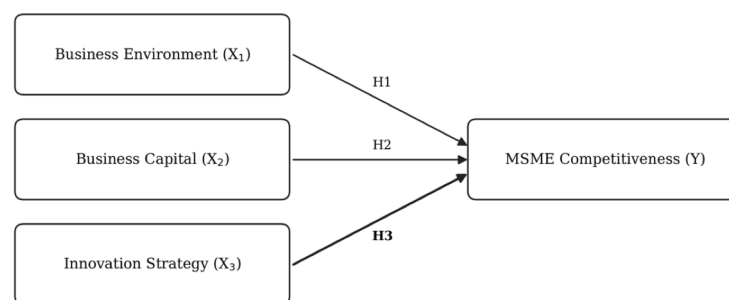


Figure 1. Research model

The study makes three contributions. Theoretically, it extends the resource-based view to a population of microenterprises operating in a circular-economy niche and demonstrates that internal capability, rather than factor endowment, is the binding determinant of competitiveness in that setting. Methodologically, it provides a fully specified and assumption-tested regression model with effect sizes and confidence intervals, which is uncommon in the regional MSME literature. Practically, it supplies the Sidoarjo Office of Cooperatives and MSMEs, financial institutions, and enterprise owners with a ranked evidence base for allocating limited development resources. The remainder of the paper is organised as follows. Section 2 sets out the research design, population and sample, instrumentation, and analytical procedure. Section 3 reports the descriptive results, instrument quality, assumption tests, and hypothesis tests, and discusses their theoretical and practical

meaning together with the limitations of the study. Section 4 concludes and offers recommendations for practice, policy, and future research.

2. RESEARCH METHOD

2.1. Research Design

This research applies an explanatory quantitative design. The design is appropriate because the objective is not to describe a phenomenon but to test directional hypotheses about causal relationships between defined constructs, and because the constructs of interest can be operationalised as measurable perceptual scales. Primary cross-sectional data were collected directly from MSME owner-managers in Sidoarjo Regency and analysed with multiple linear regression.

2.2. Population, Sample, and Sampling Procedure

The population comprises owners or managers of MSMEs operating in Sidoarjo Regency. Because the study targets a specific segment of that population, respondents were drawn by purposive sampling using two inclusion criteria: the enterprise must use household waste, whether organic or inorganic, as a raw material for its products, and the enterprise must have been in operation for more than one year. The second criterion excludes start-ups whose competitive position has not yet stabilised. Distribution was facilitated by the Sidoarjo Office of Cooperatives and MSMEs and by local MSME associations and communities.

A total of 135 questionnaires were distributed between April and August 2025. Of these, 120 were returned complete and eligible for analysis, giving an effective response rate of 88.9 per cent; the 15 excluded returns were either not returned or were incomplete on whole construct blocks. The final sample of $N = 120$ exceeds the conventional minimum of ten observations per estimated parameter and satisfies the requirement of at least $50 + 8k$ observations for multiple regression with $k = 3$ predictors (Hair et al., 2019). Respondents are distributed across five sub-districts of Sidoarjo: Sidoarjo Kota, Candi, Waru, Taman, and Buduran. The composition of the sample is reported in Table 1.

Table 1. Characteristics of respondents and enterprises ($N = 120$)

Characteristic	Category	Frequency	Percentage (%)
Business sector	Culinary	54	45.0
	Handicraft	24	20.0
	Fashion	18	15.0
	Services	12	10.0
	Others	12	10.0
Business age	1–3 years	36	30.0
	4–7 years	48	40.0
	More than 7 years	36	30.0
Enterprise scale	Micro–small (2–10 employees)	120	100.0
Waste input used	Organic and/or inorganic household waste	120	100.0

Source: primary data processed, 2025.

2.3. Instrumentation and Measurement

Data were collected with a structured questionnaire supplemented by structured interviews conducted at the point of data collection. Every construct was measured reflectively on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The operational definitions and indicators of the four constructs are set out in Table 2; indicators were adapted from Akhyar et al. (2021) for the business environment, from Rinawiyanti (2016) and Manggu et al. (2024) for business capital, from Sanchez-Henriquez and Pavez (2021) and Nuraini et al. (2024) for innovation strategy, and from Muslih and Erlando (2019) for competitiveness.

Table 2. Operationalisation of variables

Variable	Operational definition	Indicators	Scale
Business environment (X_1)	The external conditions surrounding the enterprise that facilitate or constrain its operation.	Regulatory support; adequacy of infrastructure; market access; access to business information; community and institutional support.	5-point Likert
Business capital (X_2)	The availability, accessibility, and management of financial resources used to operate and expand the enterprise.	Adequacy of own capital; access to financing institutions; ease of obtaining expansion capital; allocation of capital to production; capital management practice.	5-point Likert
Innovation strategy (X_3)	The deliberate pursuit of new products, processes, and	Waste-based product innovation; process innovation; marketing innovation through digital marketing and social media;	5-point Likert

	marketing approaches to create added value.	organisational and business-model innovation.	
MSME competitiveness (Y)	The relative ability of the enterprise to sustain and improve its market position against competitors.	Price competitiveness; product quality; growth of market share; customer loyalty; capacity for differentiation.	5-point Likert

Source: adapted from Muslih and Erlando (2019), Akhyar et al. (2021), and Nuraini et al. (2024).

2.4. Data Collection Procedure and Research Ethics

Field work was conducted over five months, from April to August 2025. Enumerators, including two student research assistants, administered the instrument in person at respondents' business premises, which allowed immediate clarification of items and verification of the waste-input criterion. Participation was voluntary and preceded by verbal informed consent explaining the academic purpose of the study, the absence of commercial use, and the right to withdraw. No, personally identifying information was recorded in the analytical dataset; enterprise names were replaced by numeric codes at the data-entry stage, and results are reported only in aggregate form. Missing entries detected during data entry affected less than one per cent of all data cells and were resolved by re-confirmation with the respondent during the clarification interviews rather than by imputation.

2.5. Data Analysis Technique

Data were analysed with SPSS. The analytical sequence comprised item validity testing using corrected item-total correlations, reliability testing using Cronbach's alpha, descriptive analysis, the full set of classical assumption tests required for ordinary least squares estimation, Pearson product-moment correlation, and multiple linear regression. Outliers were screened with standardised z-scores ($|z| > 3$) and Mahalanobis distance. The estimated model is specified as:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e \quad (1)$$

Where Y denotes MSME competitiveness, X_1 the business environment, X_2 business capital, and X_3 innovation strategy; α is the constant, β_1 to β_3 are the regression coefficients, and e is the error term. Hypotheses were tested with t-statistics at $\alpha = 0.05$ for partial effects and with the F-statistic for the simultaneous effect. Explanatory power is reported as R^2 and adjusted R^2 , and practical magnitude as Cohen's f^2 (Cohen, 1988). Ninety-five per cent confidence intervals are reported for every coefficient so that precision, and not only significance, can be assessed.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Descriptive Statistics

Screening confirmed that all 120 returned questionnaires were complete after clarification, and neither the z-score criterion nor Mahalanobis distance identified extreme observations requiring deletion; the full sample was therefore retained. Descriptive statistics for the four constructs are presented in Table 3. All means fall within the 3.41–4.20 band, which on a five-point Likert scale corresponds to the high category, indicating that respondents assess their business environment, capital availability, innovation practice, and competitive position as generally favourable.

Table 3. Descriptive statistics of research variables (N = 120)

Variable	Mean	Median	SD	Min	Max	Category
Business environment (X_1)	3.86	3.90	0.52	2.40	5.00	High
Business capital (X_2)	3.64	3.70	0.61	2.00	5.00	High
Innovation strategy (X_3)	3.98	4.00	0.49	2.60	5.00	High
MSME competitiveness (Y)	3.92	4.00	0.47	2.50	5.00	High

Source: primary data processed with SPSS, 2025.

Three patterns deserve emphasis. Innovation strategy records the highest mean (3.98), driven mainly by the marketing-innovation indicators covering digital marketing and social-media use and by waste-based product innovation; awareness of innovation among Sidoarjo MSMEs is therefore already well established. Business capital records the lowest mean (3.64) together with the widest dispersion ($SD = 0.61$), with the most heterogeneous responses concentrated on access to financing institutions and ease of obtaining additional expansion capital. This pattern is a direct measurement of financing inequality between enterprises. Competitiveness, by contrast, shows the narrowest dispersion ($SD = 0.47$), implying a comparatively homogeneous perception of competitive position at a moderate-to-high level across all sub-sectors.

3.1.2. Validity and Reliability of the Instrument

All statements across the four constructs produced corrected item-total correlations above the 0.30 threshold, and every construct returned a Cronbach's alpha within the 0.78–0.86 range, comfortably above the 0.70 criterion. The instrument is therefore both valid and reliable, as summarised in Table 4.

Table 4. Validity and reliability test results

Construct	Number of items	Corrected item-total correlation	Cronbach's alpha	Decision
Business environment (X ₁)	5	> 0.30	0.82	Valid and reliable
Business capital (X ₂)	5	> 0.30	0.86	Valid and reliable
Innovation strategy (X ₃)	5	> 0.30	0.84	Valid and reliable
MSME competitiveness (Y)	5	> 0.30	0.78	Valid and reliable

Source: primary data processed with SPSS, 2025.

3.1.3. Classical Assumption Tests

Before estimation, the full set of assumptions underlying ordinary least squares was examined so that the estimator can be regarded as the best linear unbiased estimator. The results appear in Table 5. Residual normality is supported by both the one-sample Kolmogorov–Smirnov test and the Shapiro–Wilk test, and by visual inspection of the normal P-P plot, in which the points follow the diagonal. It is worth adding that with N = 120 the central limit theorem provides additional assurance regarding the stability of parameter inference even under minor departures from normality; the distributional evidence is nevertheless reported in full for transparency.

Table 5. Classical assumption test results

Assumption	Test	Result	Decision
Residual normality	Kolmogorov–Smirnov	Z = 0.067; p = 0.200	Met
Residual normality	Shapiro–Wilk	W = 0.987; p = 0.312	Met
Multicollinearity	Tolerance / VIF – X ₁	0.65 / 1.54	Met
Multicollinearity	Tolerance / VIF – X ₂	0.72 / 1.39	Met
Multicollinearity	Tolerance / VIF – X ₃	0.58 / 1.72	Met
Heteroscedasticity	Glejser test and scatterplot	p > 0.05 for all predictors; residuals randomly dispersed	Met
Autocorrelation	Durbin–Watson	DW = 1.940 (dU 1.74 < DW < 4 – dU 2.26)	Met
Linearity	Test for linearity (ANOVA)	Deviation from linearity p > 0.05	Met

Source: primary data processed with SPSS, 2025.

Variance inflation factors for all predictors lie far below the conventional threshold of 10 and also below the conservative criterion of 5, confirming that the business environment, business capital, and innovation strategy are empirically distinguishable constructs despite being correlated with one another. The Glejser test detects no significant effect of the predictors on absolute residuals, so residual variance is homogeneous. Autocorrelation is not substantively relevant for cross-sectional data, but the Durbin–Watson statistic is reported and falls within the autocorrelation-free region. Because every assumption is satisfied without corrective treatment, neither data transformation nor robust estimation was required, and the multiple linear regression model is fit for hypothesis testing.

3.1.4. Correlations Between Constructs

Pearson product-moment correlations were computed to establish the pattern of bivariate association prior to causal estimation. The correlation matrix is reported in Table 6.

Table 6. Pearson correlation matrix

Variable	X ₁	X ₂	X ₃	Y
Business environment (X ₁)	1			
Business capital (X ₂)	0.46**	1		
Innovation strategy (X ₃)	0.52**	0.44**	1	
MSME competitiveness (Y)	0.58**	0.51**	0.67**	1

Note: ** correlation is significant at $\alpha = 0.01$ (two-tailed); $N = 120$. Source: primary data processed with SPSS, 2025.

Every predictor correlates positively and significantly with competitiveness. The strongest association is between innovation strategy and competitiveness ($r = 0.67$), conventionally classified as strong, followed by the business environment ($r = 0.58$) and business capital ($r = 0.51$). Correlations among the predictors themselves remain moderate (0.44–0.52), consistent with the multicollinearity diagnostics reported above. At this stage the correlational evidence describes association only and cannot be interpreted causally.

3.1.5. Hypothesis Testing and Model Estimation

Multiple linear regression yields the following estimated equation:

$$Y = 0.412 + 0.284 X_1 + 0.201 X_2 + 0.392 X_3 + e \quad (2)$$

The coefficient estimates, standard errors, test statistics, significance levels, and confidence intervals are reported in Table 7.

Table 7. Multiple linear regression results (dependent variable: MSME competitiveness)

Variable	B	Std. error	Beta	t	Sig.	95% CI for B
(Constant)	0.412	0.241	—	1.710	0.090	[−0.065; 0.889]
Business environment (X_1)	0.284	0.068	0.314	4.176	0.000	[0.149; 0.419]
Business capital (X_2)	0.201	0.057	0.246	3.526	0.001	[0.088; 0.314]
Innovation strategy (X_3)	0.392	0.074	0.409	5.297	0.000	[0.245; 0.539]

Source: primary data processed with SPSS, 2025.

The simultaneous test returns $F(3, 116) = 48.73$ with $p < 0.001$, so the business environment, business capital, and innovation strategy jointly exert a significant effect on MSME competitiveness. Partially, all three coefficients are positive and significant at $\alpha = 0.05$, and none of the 95 per cent confidence intervals contains zero. The overall quality of the model is summarised in Table 8.

Table 8. Model summary and simultaneous test

Statistic	Value	Interpretation
R	0.747	Strong joint association
R^2	0.558	55.8% of variance in competitiveness explained
Adjusted R^2	0.546	Explanatory power retained after penalty for predictors
Std. error of estimate	0.317	Low prediction error on a five-point scale
$F(3, 116)$	48.73	$p < 0.001$; model significant
Cohen's f^2 (model)	1.26	Very large effect

Source: primary data processed with SPSS, 2025.

Table 9 maps these estimates onto the three hypotheses. All three are supported by the data. Innovation strategy emerges as the dominant predictor on the basis of the largest standardised coefficient, followed by the business environment and then business capital.

Table 9. Summary of hypothesis testing

Hypothesis	Statement	Key evidence	Decision
H1	The business environment has a significant positive effect on MSME competitiveness in Sidoarjo	$\beta = 0.314$; $t = 4.176$; $p < 0.001$	Supported
H2	Business capital has a significant positive effect on MSME competitiveness in Sidoarjo	$\beta = 0.246$; $t = 3.526$; $p = 0.001$	Supported
H3	Innovation strategy has a significant positive effect on MSME competitiveness in Sidoarjo	$\beta = 0.409$; $t = 5.297$; $p < 0.001$	Supported (dominant)

Source: primary data processed with SPSS, 2025.

Effect sizes at the level of individual predictors reinforce this ranking. Following Cohen's convention, the f^2 value for innovation strategy is approximately 0.24, placing it in the medium-to-large band; the business environment records roughly 0.15, a medium effect; and business capital records approximately 0.11, a small-to-medium effect. In unstandardised terms, a one-unit increase in the innovation-strategy score is associated with a 0.392-unit increase in competitiveness, *ceteris paribus*, nearly twice the 0.201-unit contribution of business capital. Approximately 44.2 per cent of the variance in competitiveness remains unexplained and is attributable to determinants outside the model, such as entrepreneurial orientation, the degree of digitalisation, or technological capability.

3.1.6. Subgroup Analysis and Non-Significant Findings

Exploratory comparisons were conducted to examine whether competitiveness differs systematically across sample subgroups. The results are reported in Table 10.

Table 10. Subgroup comparisons of MSME competitiveness

Grouping variable	Test	Statistic	Effect size	Conclusion
Business age	One-way ANOVA	$F(2, 117) = 4.21; p = 0.017$	$\eta^2 = 0.067; d \approx 0.35$	Enterprises older than 7 years score higher ($M = 4.05$) than those aged 1–3 years ($M = 3.78$)
Business sector	One-way ANOVA	$p > 0.05$	$\eta^2 < 0.02$	No substantial difference across culinary, handicraft, and fashion
Gender of manager	Independent-samples t-test	$p > 0.05$	$d < 0.20$	No meaningful difference

Source: primary data processed with SPSS, 2025.

Transparent reporting requires that non-significant results be stated explicitly. First, the model constant is not significant at $\alpha = 0.05$ ($p = 0.090$), which is substantively unproblematic because the zero point of a Likert scale has no empirical meaning. Second, differences in competitiveness across business sectors and between male- and female-managed enterprises are not significant; this is plausible given that the sample is dominated by micro and small enterprises with similar operational characteristics, which compresses between-group variation through restriction of range. The gender result is consistent with the team's earlier finding that the gender of the owner does not generate large disparities in innovation performance among MSMEs (Nuraini et al., 2024). Third, at the item level, the indicator capturing the intensity of local competition within the business-environment construct shows the weakest item-total correlation, suggesting a measurement issue: respondents appear to interpret competitive intensity ambiguously, as either a threat or a stimulus. Because subgroup cell sizes are modest ($n \approx 36$ – 48), statistical power for the comparison tests is limited, and the absence of significance should not be read as evidence of the absence of an effect in the population. These null results remain informative: they indicate that the determinants of competitiveness among waste-processing MSMEs are capability-based rather than demographic or sectoral.

3.2. Discussion

3.2.1. The business environment and competitiveness

The support for H1 confirms that external conditions materially shape the competitive position of waste-based MSMEs. Supportive regulation, adequate infrastructure, reliable market access, and community support function as external preconditions without which internal capability cannot be converted into market performance. This result corroborates Akhyar et al. (2021), who identified the same determinants in Aceh Province, and is consistent with Porter's (1990) proposition that the quality of the national or regional business environment conditions firm-level advantage. For waste-based enterprises the environmental dimension carries an additional meaning: the availability and organisation of waste supply, typically mediated by waste banks and neighbourhood collection schemes, is itself part of the business environment, so that improvements in municipal waste governance translate fairly directly into more predictable input flows for these firms.

3.2.2. Business capital and competitiveness

H2 is supported, but business capital is the weakest of the three predictors in both standardised coefficient and effect size, and it simultaneously records the lowest mean and the highest dispersion. Taken together these results indicate that capital is necessary but not sufficient. Adequate funding facilitates investment and expansion (Rinawiyanti, 2016), yet unless it is channelled into innovative activity its contribution to competitiveness is limited. The wide dispersion on the financing-access indicators also identifies a distributional problem: a substantial subset of respondents remains outside the reach of formal financing institutions, which constrains the ability of the sector as a whole to convert capital into competitive advantage. This nuance qualifies the finding of Manggu et al. (2024), where business capital appeared as a comparatively prominent determinant in Bengkayang; the difference is plausibly attributable to the more developed financial infrastructure of Sidoarjo, which reduces the marginal competitive return to additional capital.

3.2.3. Innovation strategy as the dominant determinant

The dominance of innovation strategy is the central finding of the study. It provides direct empirical support for the Schumpeterian and resource-based propositions that competitive advantage originates in valuable and difficult-to-imitate internal capabilities (Schumpeter, 1934; Barney, 1991), and it is consistent with the dynamic capabilities argument that firms compete by reconfiguring resources in response to changing conditions (Teece et al., 1997). In the present context the relevant capability is the ability to transform household waste into value-added products through product, process, and marketing innovation. The result aligns with Sanchez-Henriquez and Pavez (2021), who show that open innovation improves eco-innovation

performance, and with Javeed et al. (2022) on the role of environmental strategy in driving green innovation. It also extends Manggu et al. (2024): where those authors measured marketing creativity alone, the present study shows that a broader innovation construct outperforms both environmental and financial determinants. Overall, competitiveness in this population emerges from the interaction of external and internal factors rather than from either in isolation.

3.2.4. Theoretical and Practical Implications

Theoretically, the study contributes to the resource-based view by demonstrating its applicability at the extreme lower end of the firm-size distribution. Enterprises with two to ten employees are usually assumed to compete on cost and proximity rather than on capability, yet the estimates show that the capability variable dominates the factor-endowment variable even in this segment. The study also contributes to the circular-economy literature by treating waste-processing MSMEs as a distinct analytical population rather than as an undifferentiated part of the small-business sector, and by showing that their competitive logic follows capability rather than sectoral or demographic lines.

Practically, the ranking of coefficients carries a clear allocation implication for MSME development policy. Because a one-unit gain in innovation strategy is associated with roughly twice the competitiveness gain of an equivalent movement in business capital, interventions that build innovation capacity, namely training in waste-based product development, digital marketing, and business management, are likely to deliver greater leverage than financing support alone. This does not argue for withdrawing credit programmes; the significance of H2 and the wide dispersion of financing access indicate that capital remains a binding constraint for a substantial minority of enterprises. The efficient design pairs the two, conditioning or sequencing access to credit alongside capability-building so that funds are deployed into innovation rather than into working capital alone. For the Sidoarjo Office of Cooperatives and MSMEs, the environmental coefficient further implies that investment in market access, simplified licensing, and the strengthening of waste-bank supply chains constitutes a complementary and measurable lever. For financial institutions, the results suggest that innovation activity is a defensible screening criterion for lending to this segment. For enterprise owners, the practical message is that sustained investment in product and marketing innovation, particularly digital channels, is the highest-return use of scarce managerial attention.

3.2.5. Limitations of the Study

Four limitations qualify these conclusions. First, the design is cross-sectional, so the estimated relationships establish association under a theoretically specified model rather than temporal causality; reverse causality, in which more competitive enterprises subsequently invest more in innovation, cannot be excluded. Second, all constructs are measured through self-reported perceptions of a single respondent per enterprise, which exposes the estimates to common-method variance and to social desirability bias; objective indicators such as turnover growth, margin, or number of new products were not available for this population. Third, the sample is confined to 120 waste-based MSMEs in five sub-districts of Sidoarjo Regency selected purposively, so the findings generalise to comparable waste-processing enterprises in similar peri-urban East Javanese settings rather than to Indonesian MSMEs at large; subgroup cell sizes of roughly 36 to 48 further limit the statistical power of the comparison tests. Fourth, the model explains 55.8 per cent of the variance, leaving 44.2 per cent attributable to omitted determinants such as entrepreneurial orientation, human capital, digital maturity, and supply-chain position. Future research should therefore adopt longitudinal or panel designs, incorporate objective performance measures and multiple informants, extend the sampling frame across several regencies to permit comparative estimation, and test mediating and moderating structures, in particular whether innovation strategy mediates the effect of business capital on competitiveness, using structural equation modelling.

4. CONCLUSION

This study set out to determine how the business environment, business capital, and innovation strategy affect the competitiveness of MSMEs that use household waste as a production input in Sidoarjo Regency. Using primary data from 120 owner-managers selected purposively from a distribution of 135 questionnaires, and estimating a multiple linear regression model that satisfies all classical assumptions, the study answers all three research questions affirmatively. The business environment ($\beta = 0.314$; $p < 0.001$), business capital ($\beta = 0.246$; $p = 0.001$), and innovation strategy ($\beta = 0.409$; $p < 0.001$) each exert a positive and significant partial effect on competitiveness, and jointly they explain 55.8 per cent of its variance ($F(3, 116) = 48.73$; $p < 0.001$; adjusted $R^2 = 0.546$), a very large effect by conventional criteria. Innovation strategy is the dominant determinant, business capital the weakest. Competitiveness also rises with enterprise age but does not differ substantially by sector or by the gender of the manager.

The principal implication is that the competitiveness of waste-based microenterprises is capability-driven. For policymakers, this argues for rebalancing MSME development budgets towards structured innovation training in waste-based product development, digital marketing, and business management, while retaining and better

targeting financing schemes for the substantial minority of enterprises that remain outside the formal credit system. For financial institutions, demonstrated innovation activity offers a practical screening criterion. For enterprise owners, continuous product and marketing innovation is the highest-return use of limited resources. Theoretically, the study extends the resource-based view to a circular-economy microenterprise population and shows that internal capability outweighs factor endowment even at the smallest scale of enterprise.

These conclusions should be read alongside the limitations set out in Section 3.9, notably the cross-sectional design, reliance on single-respondent perceptual measures, and the purposive single-regency sample. Future research should pursue longitudinal and multi-regency designs, incorporate objective performance indicators, and test whether innovation strategy mediates the relationship between business capital and competitiveness. Establishing that mediation would convert the present ranking of determinants into an actionable causal sequence for MSME development policy.

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