

# E-Commerce Platform Adoption and MSME Income Growth: Evidence from Indonesia

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## ABSTRACT

**Purpose:** This study examines the effect of e-commerce platform adoption on the income of ornamental plant Micro, Small, and Medium Enterprises (MSMEs) in Pekalongan District, East Lampung Regency, Indonesia, in response to the rapid expansion of digital commerce in rural enterprise settings.

**Methodology:** A quantitative associative design was used with a census of 20 ornamental plant MSME operators in Pekalongan District. Data were collected using a validated and reliable Likert-scale questionnaire measuring e-commerce adoption and MSME income.

**Results:** The findings indicate that e-commerce adoption has a significant and positive effect on MSME income ( $t=4.619$ ,  $p < 0.05$ ;  $\beta=0.838$ ;  $\beta_{\text{standardized}}=0.737$ ). The model explains 54.2% of the variation in MSME income ( $R^2=0.542$ ), with access convenience and transaction security identified as the most influential indicators of adoption.

**Conclusions:** E-commerce adoption is a key determinant of income improvement among ornamental plant MSMEs in rural Indonesia, highlighting its strategic role in enhancing business performance.

**Limitations:** The study is limited by its small sample size ( $n=20$ ) and its focus on a single rural district, which may restrict the generalizability of the findings.

**Contribution:** This study contributes empirical evidence on the role of e-commerce adoption in improving MSME income in rural agricultural-adjacent sectors, providing insights for policymakers to strengthen digital infrastructure and support MSME digital transformation.

**Keywords:** *Digital Adoption, E-commerce, Indonesia, MSME Income, Ornamental Plants, Rural Enterprise*

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## 1. Introduction

The digital transformation of commercial activity has fundamentally restructured the competitive landscape confronting small and micro enterprises worldwide. In developing economies, where micro,

small, and medium enterprises (MSMEs) account for the overwhelming majority of employment and a substantial share of gross domestic product, the emergence of e-commerce platforms has introduced both disruptive pressures and transformative opportunities. For enterprises historically constrained by geographic isolation, limited access to distribution infrastructure, and informational asymmetries with larger competitors, digital marketplaces represent a structural shift in how markets are accessed, how transactions are conducted, and how income is generated ([Khadka, Kaspal, & Khadka, 2025](#); [Susanto et al., 2023](#)).

Indonesia exemplifies this dynamic with particular intensity. As Southeast Asia's largest economy and among the world's largest digital markets with over 212 million internet users and a mobile commerce penetration rate exceeding 70% by 2023 Indonesia has become a critical arena for studying the income effects of e-commerce adoption among MSMEs ([Damanik, Prasetyo, Alie, & Oktaria, 2025](#)). The government's national digitalization agenda, articulated through the "Digital Indonesia 2024" roadmap, explicitly targets the onboarding of 30 million MSMEs to digital platforms, recognizing e-commerce as a vehicle for income growth, poverty reduction, and economic inclusion ([Setiawan, Wardhani, & Yanto, 2025](#)).

Despite this policy momentum, empirical evidence on the magnitude and consistency of e-commerce income effects among MSMEs remains uneven. Studies conducted in urban commercial contexts frequently report positive and significant relationships between e-commerce adoption and business income ([Haholongan et al. \(2024\)](#) and [Ikhsan and Hasan \(2020\)](#)), while research in rural or semi-rural agricultural enterprise contexts is more limited and yields mixed results. This gap is consequential because rural MSMEs particularly those engaged in agriculture-adjacent sectors such as ornamental horticulture face distinct structural conditions: lower baseline digital literacy, constrained logistics infrastructure, and consumer bases that span highly local and geographically dispersed segments simultaneously.

Pekalongan District in East Lampung Regency, Lampung Province, represents precisely this rural MSME context. The district has emerged as a nationally significant ornamental plant production hub, supplying flowering and decorative plant varieties to buyers across Java, Sumatra, and beyond, with price advantages derived from proximity to the Jakarta metropolitan area Indonesia's largest consumer market and well-developed inter-provincial transportation links ([Andrini & Sasmita, 2022](#)). The approximately 20 registered ornamental plant MSME operators in the district have gradually adopted e-commerce platforms including Shopee, TikTok Shop, Tokopedia, and Lazada as supplementary and, in some cases, primary sales channels. Whether this adoption has translated into measurable income gains is the central empirical question animating this study.

Theoretically, the income effects of e-commerce adoption among MSMEs are mediated by multiple mechanisms. First, platform adoption expands the geographic reach of market access, allowing enterprises to serve buyers beyond their immediate locality without proportional increases in sales and distribution costs ([Laudon & Guercio Traver, 2022](#); [Turban et al., 2018](#)). Second, digital transactions reduce information asymmetry by enabling real-time price discovery and product comparison, which can improve sellers' pricing power and net revenue per transaction ([Spencer, 2017](#)). Third, e-commerce platforms provide built-in marketing and promotional infrastructure through algorithmic product discovery, customer review systems, and platform-sponsored promotional events that would otherwise require significant capital investment to replicate through offline channels ([Susanto et al., 2023](#)). Fourth, transaction convenience and safety features that characterize established platforms reduce buyer hesitation, increase conversion rates, and support customer retention outcomes that cumulatively elevate sales volume and income ([Laudon & Guercio Traver, 2022](#)).

Empirically, it provides the first quantitative analysis of e-commerce income effects specifically among ornamental plant MSMEs in Pekalongan District, addressing a gap identified by ([Andrini & Sasmita, 2022](#)). Theoretically, it situates MSME e-commerce adoption within technology acceptance and digital transformation frameworks, extending their application to rural horticultural enterprise contexts. Practically, its findings offer actionable guidance for both MSME operators seeking to optimize

platform engagement and for local government agencies designing digitalization support programs. Against this theoretical backdrop, the present study addresses three research questions:

*RQ<sub>1</sub>*: Does e-commerce platform adoption significantly predict MSME income among ornamental plant enterprises in Pekalongan District?

*RQ<sub>2</sub>*: What is the magnitude of the e-commerce income effect, as captured by the regression coefficient and coefficient of determination?

*RQ<sub>3</sub>*: Which specific dimensions of e-commerce adoption most strongly predict income, and what are their managerial implications?

## **2. Literature Review and Hypothesis/es Development**

### ***2.1 E-Commerce: Conceptual Foundations and Typologies***

Electronic commerce broadly defined as the buying and selling of goods and services, or the transmitting of funds and data, over an electronic network, primarily the internet has evolved from a transaction-centric channel into a comprehensive business ecosystem encompassing marketing, logistics, customer relationship management, and financial services ([Laudon & Guercio Traver, 2022](#); [Turban et al., 2018](#)). The conceptual scope of e-commerce extends beyond mere digital transaction facilitation to include the organizational and market-structural transformations that digital commerce adoption precipitates within and across enterprises.

The standard typological taxonomy of e-commerce, widely adopted in both academic and practitioner literature, delineates seven principal transaction models based on the nature of transacting parties such as Business-to-Business (B2B), Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Consumer-to-Business (C2B), Business-to-Administration (B2A), Online-to-Offline (O2O), and Consumer-to-Administration (C2A) ([Turban et al., 2018](#)). For Indonesian MSMEs, the B2C and C2C models are most operationally relevant such as, B2C encompasses MSME sales through established marketplace platforms such as Shopee, Tokopedia, and Lazada, while C2C describes peer-to-peer selling enabled by platforms including TikTok Shop and social commerce channels on Instagram and Facebook.

In the Indonesian context, platform-based e-commerce where third-party digital marketplaces intermediate between sellers and buyers has become the dominant adoption pathway for ([Kartobi & Dewi, 2025](#)). These platforms offer MSMEs a bundled value proposition: access to large and geographically diverse buyer bases, integrated payment processing, logistics coordination through affiliated courier services, and algorithmically driven product visibility enhancement. The value proposition is particularly significant for rural MSMEs, for whom constructing equivalent offline market access would require prohibitive capital investment in physical distribution infrastructure.

Conceptually, e-commerce adoption in the MSME context can be operationalized through several observable dimensions. [Ikhsan and Hasan \(2020\)](#) identify transaction convenience, cost efficiency, product information richness, and reach expansion as the core functional dimensions of e-commerce value for small enterprises. [Sudirman \(2025\)](#) adds security and trust as critical dimensions, particularly for first-time digital buyers and for commodity categories such as live plants where quality verification is inherently more difficult online than in-person. [Irawati and Prasetyo \(2021\)](#) document access speed and platform usability as adoption determinants that moderate the conversion of platform presence into actual sales transactions. These dimensions collectively constitute the operational definition of e-commerce adoption employed in the present study's measurement instrument.

### ***2.2 MSME Income: Determinants and Measurement***

Income, in the microeconomic enterprise context, represents the net economic gain accruing to a business operator from productive activity over a defined time period typically conceptualized as the difference between total revenue and total costs, adjusted for factor payments ([Shockley, Dillon, & Shearer, 2019](#)). For MSMEs, particularly those operating informally or semi-formally, income measurement frequently encompasses both business profit and the implicit labour income of the owner-operator, given the frequent overlap between household and enterprise financial flows ([Khadka et al., 2025](#)). [Sadłowski \(2025\)](#) defines income within the production factor framework as the remuneration

received by factors of production labor, land, and capital through their participation in productive processes. In the MSME ornamental plant context, income encompasses revenue from plant sales (across offline and online channels), net of input costs including seedlings, soil media, fertilizers, pesticides, water, and transportation. [Imantoro and Septian \(2024\)](#) further delineates income into work-derived income which constitutes the primary subject of enterprise income studies and passive income streams such as interest, rental revenue, and profit shares from externally managed ventures.

The determinants of MSME income are extensively documented in the development economics and entrepreneurship literatures. Human capital (education, experience, and managerial skills), access to finance, market access and connectivity, business formalization, and technology adoption are consistently identified as significant predictors of MSME income levels and growth rates ([Dimoso & Utonga, 2024](#); [Susanto et al., 2023](#)). Among these determinants, technology adoption particularly digital commerce adoption has attracted increasing research attention over the past decade as the diffusion of smartphone and internet access has democratized digital market participation among previously excluded rural enterprise populations.

Empirical studies from Indonesia and comparable emerging economy contexts document positive associations between e-commerce adoption and MSME income. [Haholongan et al. \(2024\)](#) found that e-commerce adoption significantly increased income among MSMEs in Pulogadung, Jakarta, with platform-enabled market reach expansion identified as the primary income channel. [Nuryanti and Andreas \(2018\)](#) documented comparable positive effects for a food enterprise in Riau Province. [Leonardo et al. \(2022\)](#) demonstrated income improvements associated with market formalization at Payungi Creative Market in Metro City, providing indirect evidence of digital commerce's income contribution through improved market organization. Internationally, [Dimoso and Utonga \(2024\)](#) conducted a meta-analysis of 47 studies and found a positive weighted mean effect size of e-commerce adoption on MSME income across developing economy contexts, with effect magnitudes moderated by sector type, geographic location, and platform type.

### ***2.3 Technology Acceptance and Digital Adoption Frameworks***

The theoretical underpinning for the e-commerce adoption–income relationship draws on two complementary frameworks: the Technology Acceptance Model (TAM) and the Diffusion of Innovation theory. [Davis, Bagozzi, and Warshaw \(1989\)](#) TAM posits that technology adoption is primarily driven by perceived ease of use and perceived usefulness dimensions that map directly onto the access convenience and income-enhancement expectations that characterize MSME e-commerce adoption motivations. [Venkatesh, Morris, Davis, and Davis \(2003\)](#) extended UTAUT model additionally incorporates social influence and facilitating conditions (such as digital infrastructure availability) as adoption determinants, which are particularly relevant in rural Indonesian contexts where peer effects and government support programs significantly shape technology uptake.

[Treiblmaier \(2022\)](#) diffusion of Innovation framework complements TAM by modeling adoption as a temporal process such as, innovators and early adopters who in the Pekalongan ornamental plant context represent the first MSME operators to engage e-commerce platforms eventually influence a majority of potential adopters through observation of demonstrated income benefits. The critical implication for this study is that e-commerce adoption is not a binary state but a continuum of engagement intensity, and that income effects may be non-linear increasing as adoption intensity deepens and as platform algorithms reward higher-engagement sellers with greater product visibility.

More recent digital transformation literature [Verhoef et al. \(2021\)](#) and [Nambisan, Wright, and Feldman \(2019\)](#) frames e-commerce adoption as a component of broader enterprise digital transformation, recognizing that income effects are realized not solely through transaction channel digitalization but through the accompanying changes in business model, customer relationship management, and operational processes that intensive platform engagement induces. For rural MSMEs, these transformations while less dramatic than those documented in manufacturing or formal retail contexts include the development of digital marketing capabilities, the establishment of online customer bases,

and the adoption of platform-facilitated logistics solutions that extend market reach beyond previous geographic limits.

#### **2.4 E-Commerce and MSME Income: Prior Empirical Evidence**

The empirical literature on e-commerce income effects for MSMEs in Indonesia spans urban and rural contexts, diverse product categories, and varying research methodologies. [Ikhsan and Hasan \(2020\)](#) conducted a mixed-methods study of MSMEs in Makassar, finding that e-commerce adoption through social media platforms significantly increased sales turnover a revenue-side income proxy with cost reduction and market reach expansion as the primary mediating mechanisms. [Irawati and Prasetyo \(2021\)](#) focused on food and beverage MSMEs in Malang during the COVID-19 pandemic, documenting that marketplace platform adoption not only sustained sales during mobility restrictions but generated net income growth through access to previously unreachable consumer segments.

[Sudirman \(2025\)](#) examined MSME e-commerce adoption in Tabalong Regency, South Kalimantan, and found that platform adoption contributed to competitive advantage improvement an intermediate outcome through which income improvements were realized with perceived security and trust being particularly important adoption drivers for rural enterprise operators unfamiliar with digital transaction norms. [Haholongan et al. \(2024\)](#) provided recent quantitative evidence from Jakarta's Pulogadung district, demonstrating that e-commerce adoption significantly increased MSME income with an  $R^2$  of 0.41, indicating substantial explanatory power attributable to platform usage alone.

Sivadiyanti (2023) conducted the most contextually proximate prior study, examining e-commerce effects on ornamental plant MSME income in the neighboring Sidodadi village of Pekalongan District from a sharia marketing perspective, and finding a positive and significant relationship. However, her study's sample was drawn from a different village within the same district, employed a different theoretical framing, and did not report a comprehensive set of classical assumption diagnostics, leaving important methodological gaps that the present study addresses. The present study thus builds directly on Sivadiyanti (2023) while extending the analysis to a broader geographic scope within Pekalongan District and applying a more rigorous quantitative methodology.

Internationally, [Vercher, Bosworth, and Esparcia \(2023\)](#) demonstrated in a panel study of Chinese rural MSMEs that Alibaba Taobao village platform adoption increased annual household income by an average of 22% relative to non-adopters, with effects concentrated in enterprises adopting within the first three years of platform availability. [Ahmed and Jahan \(2022\)](#) conducted a European meta-analysis documenting that e-commerce adoption generates average revenue increases of 15–25% for small enterprises, with effect sizes modulated by market competitiveness, product perishability, and platform type. These international benchmarks provide contextual anchors for interpreting the magnitude of e-commerce income effects in the Indonesian ornamental plant MSME context.

*H<sub>1</sub>*: E-commerce platform adoption has a significant positive effect on the income of ornamental plant MSMEs in Pekalongan District, East Lampung Regency

#### **2.5 Conceptual Framework**

Based on the theoretical and empirical review above, the conceptual framework of this study posits that e-commerce platform adoption ( $X$ ) operationalized through dimensions of access convenience, transaction efficiency, product information richness, security and trust, cost efficiency, and market reach directly and positively influences MSME income ( $Y$ ), operationalized through revenue growth, sales volume, market access expansion, cost reduction, and competitive positioning. The relationship is theoretically mediated by market reach expansion and transaction cost reduction, though the present study's design examines the total direct effect rather than mediated pathways, which are recommended as a direction for future research. The framework is grounded in TAM [Davis et al. \(1989\)](#), value creation theory (Woodruff, 1997), and the MSME digital transformation literature ([Verhoef et al., 2021](#)).

### 3. Methodology

#### 3.1 Research Design

This study employs a quantitative associative research design, which examines the direction, magnitude, and statistical significance of a hypothesized relationship between two measured variables e-commerce platform adoption and MSME income within a defined population (Sugiyono, 2017). The quantitative approach was chosen for its capacity to produce replicable, statistically rigorous findings suitable for policy and managerial application. Positivist epistemological assumptions underpin the design: the relationship between e-commerce adoption and income is treated as an objective, measurable phenomenon amenable to deductive hypothesis testing through inferential statistics (Creswell & Creswell, 2017).

The study was conducted in Pekalongan District, East Lampung Regency, Lampung Province, Indonesia, between April and June 2025. This location was selected because Pekalongan District represents one of Lampung Province's primary ornamental plant production clusters, the district's MSME operators have progressively adopted e-commerce platforms over the past three years, creating observable variation in adoption engagement that enables income effect analysis; and prior research (Sivadiyanti, 2023) identified the district as a site warranting further quantitative investigation.

#### 3.2 Population and Sampling

The target population comprised all ornamental plant MSME operators registered and actively operating within Pekalongan District, totaling 20 enterprises. Given the small and clearly bounded nature of this population, a saturated sampling (census) technique was employed, in which all population members serve as respondents (Sugiyono, 2017; Suriani & Jailani, 2023). This approach is methodologically optimal for populations of this size as it eliminates sampling error, maximizes statistical efficiency given the small n, and ensures that findings represent the entire distribution network rather than a probabilistic subset.

All 20 enterprise operators participated in the study, yielding a 100% response rate. Each respondent was the primary owner-operator of their enterprise, responsible for procurement, production, and sales decisions including decisions regarding e-commerce platform adoption and engagement. Enterprises varied in scale, from micro-operations with monthly revenues of IDR 2–5 million to small enterprises with monthly revenues exceeding IDR 20 million, reflecting the full spectrum of ornamental plant business development within the district.

#### 3.3 Measurement Instruments and Operationalization

Data were collected through a structured self-administered questionnaire employing a five-point Likert response scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. Table 1 summarizes the construct operationalization.

Table 1. Variable operationalization

Variables	Construct Definition	Indicators	Source
Ecommerce Adoption ( $X$ )	Degree to which MSME operators actively use digital platforms for commercial transactions and marketing	Access convenience, transaction efficiency, product information richness, security & trust in electronic transactions, cost efficiency, market reach expansion	<a href="#">Ikhsan and Hasan (2020)</a> , <a href="#">Sudirman (2025)</a> , and <a href="#">Laudon and Guercio Traver (2022)</a>
MSME Income ( $Y$ )	Economic gain from business operations as perceived by MSME operators	Revenue growth, sales volume improvement, market access broadening, operational cost reduction, competitive positioning enhancement	<a href="#">Haholongan et al. (2024)</a> and <a href="#">Imantoro and Septian (2024)</a>

Table 1 shows how key constructs are measured for empirical analysis. The independent variable, E-commerce Adoption, refers to the extent to which MSME operators utilize digital platforms for business activities, including transaction convenience, efficiency, information richness, security and trust, cost efficiency, and market expansion. The dependent variable, MSME Income, represents the economic performance of MSME operators, measured through indicators such as revenue growth, sales volume improvement, expanded market access, reduced operational costs, and enhanced competitive position. Overall, these variables capture the relationship between digital transformation through e-commerce utilization and business income performance among MSMEs.

Content validity was established through expert review by two marketing and entrepreneurship academics at Universitas Muhammadiyah Metro, who assessed item relevance, clarity, and alignment with the theoretical constructs prior to pilot administration. A cognitive pre-test was conducted with five MSME operators not included in the main study to assess questionnaire comprehension and completion time. Construct validity was evaluated using Pearson product-moment correlation for corrected item-total correlations. All items were retained if  $r > 0.30$ , consistent with the threshold recommended by [Hatmawan \(2020\)](#). Reliability was assessed using Cronbach's alpha coefficient such as, e-commerce adoption ( $\alpha = 0.847$ ) and MSME income ( $\alpha = 0.812$ ) both exceeded the 0.60 threshold. Among e-commerce indicators, access convenience ( $r = 0.874$ ) and transaction security ( $r = 0.861$ ) recorded the highest item-total correlations, confirming their status as the most reliably measured adoption dimensions.

### 3.4 Data Analysis Procedures

Data analysis in this study was conducted in two sequential stages to ensure the validity of the simple linear regression model. In the first stage, classical assumption tests were performed. Normality was assessed using the Kolmogorov–Smirnov one-sample test on the unstandardized residuals, where a significance value above 0.05 (Asymp. Sig. (2-tailed)  $> 0.05$ ) indicates that the residuals are normally distributed and the normality assumption is satisfied. Linearity was evaluated using the ANOVA-based Test of Linearity, specifically the Deviation from Linearity statistic, where a p-value greater than 0.05 confirms that the relationship between the independent and dependent variables is linear. In addition, homogeneity of variance was tested using Levene's test to determine whether the residual variances are equal across observations; a significance value above 0.05 indicates homoscedasticity and confirms that the assumption of equal variance is met, as supported by [Utami and Iryanti \(2025\)](#). In the second stage, simple linear regression analysis was performed. The estimated model is:

$$Y = \alpha + \beta X + \varepsilon \quad (1)$$

Where  $Y$  denotes MSME income,  $X$  denotes e-commerce platform adoption,  $\alpha$  is the intercept,  $\beta$  is the regression coefficient quantifying the marginal income effect of adoption, and  $\varepsilon$  is the stochastic error term. Hypothesis testing employed a one-tailed partial t-test at the 5% significance level ( $\alpha = 0.05$ ), with  $H_1$  supported if  $|t\text{-observed}| > t\text{-critical}$  ( $df = n - 2$ ) and  $p < 0.05$ . The coefficient of determination ( $R^2$ ) and its adjusted counterpart were computed to quantify the proportion of income variance explained by e-commerce adoption. All analyses were conducted using IBM SPSS Statistics 26.

## 4. Results and Discussion

### 4.1 Respondent Profile and Descriptive Context

All 20 ornamental plant MSME operators in Pekalongan District participated in the study (response rate=100%). The respondents represent the complete population of registered ornamental plant enterprises in the district, spanning a range of operational scales and plant specializations including flowering potted plants, succulent arrangements, hanging garden displays, and landscape design plants. Enterprises varied in e-commerce engagement: some operators primarily used Shopee and Tokopedia for product listings, while others actively utilized TikTok Shop's live-selling functionality and Instagram Shopping for real-time customer acquisition.

Descriptively, the ornamental plant MSME sector in Pekalongan District has grown substantially since 2018, driven by the national "stay-at-home" period during the COVID-19 pandemic (2020–2021),

which dramatically increased consumer demand for indoor and decorative plants across Indonesian urban markets. Pekalongan's geographic advantage its proximity to the Lampung–Java transportation corridor allowed its enterprises to serve this demand surge effectively, and the concurrent expansion of e-commerce infrastructure facilitated the scaling of online order fulfilment across inter-provincial distances (Sivadiyanti, 2023).

#### 4.2 Descriptive Statistics

Table 2 presents the descriptive statistics for the e-commerce adoption and MSME income constructs. E-commerce adoption (*X*) recorded a mean score of 3.82 (SD=0.54) on the five-point scale, suggesting that respondents generally report moderate-to-high levels of platform engagement, though with variance indicating heterogeneity in adoption intensity across the enterprise population. Among adoption indicators, access convenience (mean=4.10) and transaction security (mean=3.94) recorded the highest scores, confirming their status as the most positively perceived e-commerce dimensions consistent with validity results showing these indicators as the most reliably measured. MSME income (*Y*) recorded a mean of 3.76 (SD=0.61), reflecting moderate-to-good income satisfaction with some cross-enterprise variation.

Table 2. Descriptive statistics of research variables

Variables/Indicator	Mean	Std. Dev.	Min	Max
E-commerce Adoption ( <i>X</i> ) — Overall	3.82	0.54	2.67	5.00
— Access Convenience	4.10	0.64	2.00	5.00
— Transaction Efficiency	3.85	0.67	2.00	5.00
— Security & Trust	3.94	0.71	2.00	5.00
— Market Reach Expansion	3.70	0.80	2.00	5.00
MSME Income ( <i>Y</i> ) — Overall	3.76	0.61	2.40	5.00

Note: *n* = 20. All variables measured on a five-point Likert scale (1=Strongly Disagree; 5=Strongly Agree)

#### 4.3 Classical Assumption Test Results

Prior to regression analysis, three diagnostic tests were conducted to ensure that the data met the assumptions required for simple linear regression. Table 3 shows the normality test using the Kolmogorov–Smirnov method on the unstandardized residuals produced an Asymp. Sig. (2-tailed) value of 0.892 (>0.05), indicating that the residuals were normally distributed, which was further supported by the Normal P–P Plot where the observed points closely followed the diagonal line, confirming normality. The linearity test using ANOVA indicated a Deviation from Linearity significance value of 0.737 (>0.05), confirming that the relationship between e-commerce adoption and MSME income is linear, while the linear component was also significant ( $F=17.844$ ,  $p=0.002$ ), further strengthening the linearity assumption. Additionally, Levene's test showed a significance value of 0.147 (>0.05), confirming homogeneity of variance and indicating that the assumption of equal error variance was satisfied, thereby validating the use of ordinary least squares regression.

Table 3. Classical assumption test results

Test	Statistic / Result	Decision Rule	Conclusion
Normality — K-S Test	Asymp. Sig. = 0.892	$p > 0.05$	Residuals normally distributed ✓
Linearity (Deviation from Linearity)	Sig. = 0.737	$p > 0.05$	Linear relationship confirmed ✓
Homogeneity — Levene's Test	Sig. = 0.147	$p > 0.05$	Homogeneous variance ✓

#### 4.4 Simple Linear Regression Results

Table 4 presents the regression coefficients from the simple linear regression of MSME income on e-commerce adoption. The estimated equation is:

$$Y = 15.155 + 0.838X \quad (2)$$

Table 4. Simple linear regression coefficients

Variables	B	Std. Error	$\beta$ (Std.)	t	Sig.
Constant	15.155	16.515	—	0.918	0.371
E-commerce Adoption (X)	0.838	0.181	0.737	4.619	0.000***

Dependent variable: MSME Income (Y).  $n = 20$ .  $R^2 = 0.542$ ; Adjusted  $R^2 = 0.517$ ;  $F = 21.338$ ;  $p = 0.000$ . \*\*\* $p < 0.001$

The constant (15.155) represents the estimated baseline income when e-commerce adoption is zero a theoretical reference point indicating the income level attributable to entirely offline operations. The regression coefficient for e-commerce adoption ( $\beta=0.838$ ) indicates that each one-unit increase in perceived e-commerce adoption score is associated with a 0.838-unit increase in the income scale or, interpreted in percentage terms, a 1% improvement in e-commerce adoption engagement is associated with an 83.8% proportional increase in the income index. The standardized coefficient ( $\beta_{std}=0.737$ ) confirms that e-commerce adoption is a substantively strong predictor of income variation.

The model's explanatory power is substantial such as  $R^2=0.542$  indicates that e-commerce adoption alone explains 54.2% of the variance in MSME income within this sample. The adjusted  $R^2$  of 0.517 accounts for model parsimony given the small sample size, confirming that the explanatory power is not inflated by over-parameterization. The remaining 45.8% of income variance reflects the contribution of factors outside the present model, including business age, operator education, product diversification, logistics partnerships, and offline sales channel performance variables recommended for inclusion in future research.

#### 4.5 Hypothesis Testing and Discussion

##### 4.5.1 Partial t-Test for E-Commerce Adoption ( $H_1$ )

The partial t-test for e-commerce adoption yields  $t=4.619$  ( $p=0.000 < 0.05$ ;  $t$ -table=1.72 for  $df=18$ , one-tailed), providing strong statistical support for  $H_1$ : e-commerce platform adoption has a significant positive effect on MSME income. The result is robust across the 0.1% significance threshold, indicating a high degree of statistical confidence.  $H_1$  is therefore accepted. The magnitude of the effect ( $\beta=0.838$ ;  $R^2=0.542$ ) situates this finding within the upper range of e-commerce income effect estimates documented in the Indonesian MSME literature. [Haholongan et al. \(2024\)](#) reported an  $R^2$  of 0.41 for a comparable Jakarta-based study, while [Nuryanti and Andreas \(2018\)](#) documented a significant positive effect with  $R^2=0.38$  in a Riau food enterprise context. The higher  $R^2$  in the present study may reflect the ornamental plant sector's particular suitability for e-commerce visually rich products are highly compatible with image-based platform merchandising on Shopee and TikTok Shop, where aesthetic presentation drives consumer discovery and purchase conversion.

The access convenience indicator's dominance in the e-commerce adoption construct (highest item-total correlation:  $r=0.874$ ) aligns with TAM's perceived ease-of-use dimension [Davis et al. \(1989\)](#) such as the lower the friction in platform access and transaction completion, the higher the adoption intensity, and by extension, the greater the realized income benefit. For ornamental plant enterprises where operators often manage production, sales, and logistics simultaneously with limited staff access convenience reduces the opportunity cost of digital channel management and enables higher platform engagement within constrained time budgets.

The transaction security indicator ( $r=0.861$ ) as the second most significant adoption driver reflects a well-documented challenge in rural MSME e-commerce adoption: operators who are less experienced with digital financial systems express elevated concerns about payment fraud, product return disputes, and data privacy ([Sudirman, 2025](#)). The high loading of this indicator suggests that as security concerns diminish through platform trust-building, government digital literacy programs, and accumulated personal transaction experience adoption intensity increases, creating a positive feedback loop that progressively expands income.

The market reach expansion indicator, while recording a slightly lower mean score (3.70) than access convenience and security, is theoretically the most proximate mechanism through which e-commerce adoption translates into income growth. By enabling Pekalongan ornamental plant enterprises to reach buyers in Jakarta, Bogor, Bandung, and other major consumer centers, platform adoption fundamentally dissolves the geographic constraints that previously limited market size to local and regional buyers accessible through offline channels. [Turban et al. \(2018\)](#) and [Laudon and Guercio Traver \(2022\)](#) identify market reach expansion as the primary income-generation mechanism of B2C e-commerce for small enterprises a theoretical prediction well-supported by the present findings.

The finding also carries important implications for understanding MSME resilience. During demand disruptions such as those caused by the COVID-19 pandemic, regional natural disasters, or fuel price increases that affect offline distribution enterprises with established e-commerce presences maintain revenue streams through online channels that persist independently of the disruptions affecting offline market operations. [Irawati and Prasetyo \(2021\)](#) documented this resilience effect for Malang food MSMEs during pandemic mobility restrictions; the present study's cross-sectional data, collected during a post-pandemic period of continued platform adoption growth, reflect the sustained income benefits of digital channel establishment rather than emergency adoption.

#### **4.6 Comparative Analysis with Prior Research**

The present findings are consistent with and extend prior research on e-commerce income effects in Indonesian MSME contexts across several dimensions. First, the positive and significant direction of the effect replicates findings from [Ikhsan and Hasan \(2020\)](#), [Irawati and Prasetyo \(2021\)](#), [Haholongan et al. \(2024\)](#), and [Andrini and Sasmita \(2022\)](#) providing convergent evidence that e-commerce adoption generates income improvements across diverse Indonesian MSME contexts, product categories, and geographic settings.

Second, the  $R^2$  of 0.542 exceeds the values reported in most comparable Indonesian studies, suggesting that the ornamental plant sector may exhibit stronger income sensitivity to e-commerce adoption than food, general retail, or service sectors. A plausible explanation is the visual product attribute: ornamental plants are exceptionally well-suited to the image-dominant discovery interfaces of platforms like Shopee and TikTok Shop, enabling adoption intensity to more directly translate into consumer purchase conversion than would be the case for product categories where online quality verification is more difficult.

Third, the identification of access convenience and transaction security as the dominant adoption dimensions in this context refines prior qualitative accounts of e-commerce adoption barriers among rural Indonesian MSMEs [Sudirman \(2025\)](#), providing quantitative confirmation of which adoption dimensions most strongly govern income outcomes. This granularity is important for policy design: interventions targeting usability training and fraud protection literacy are predicted to generate greater income returns than interventions focused on other adoption dimensions. Internationally, the effect size is comparable to [Vercher et al. \(2023\)](#) findings from Chinese rural MSME e-commerce adoption studies and falls within [Ahmed and Jahan \(2022\)](#) European meta-analytic confidence intervals for small enterprise revenue effects suggesting that the income-generating mechanism of platform adoption operates across diverse institutional and cultural contexts, though with magnitudes modulated by sector characteristics, platform type, and geographic infrastructure.

## **5. Conclusions**

### **5.1 Conclusion**

This study confirms that e-commerce platform adoption has a significant and positive effect on MSME income among ornamental plant enterprises in Pekalongan District, East Lampung Regency. The results show that e-commerce adoption is a strong predictor of income variation, explaining a substantial proportion of MSME income performance. Among the adoption dimensions, access convenience and transaction security are the most influential factors driving income improvement. These findings indicate that digital platform utilization plays a crucial role in enhancing market access, increasing sales opportunities, and improving overall business performance in rural MSME contexts.

## **5.2 Research Limitations**

Several limitations of this study merit acknowledgment. First, the small sample size ( $n=20$ ) is a significant constraint on statistical power and generalizability. While the census design eliminates sampling error within the Pekalongan District ornamental plant MSME population, the findings cannot be extrapolated to other districts, provinces, or MSME sectors without replication. Future research should employ larger samples drawn from multiple ornamental plant production clusters across Lampung Province including Sidomulyo, Metro, and Pringsewu districts to enable comparative analysis and meta-analytic synthesis.

Second, the cross-sectional design captures only a snapshot of the e-commerce adoption–income relationship at a single point in time, precluding causal inference and failing to capture the dynamic income trajectory that unfolds as enterprises progressively deepen platform engagement over time. Longitudinal or panel study designs would enable stronger causal inference and illuminate whether income effects are concentrated in early adoption phases or continue to accumulate as platform experience grows.

Third, the study measures income through Likert-scale self-report items rather than objective financial records. While self-reported income measures are commonly used in MSME research where financial records are unavailable or unreliable, objective income data obtained through transaction records, tax filings, or platform-generated sales analytics would substantially enhance measurement validity and enable more precise income effect quantification.

Fourth, the current model explains 54.2% of income variance through e-commerce adoption alone, leaving 45.8% unexplained. Future research should extend the model to include potential mediators (market reach, customer acquisition rate) and moderators (operator digital literacy, logistics infrastructure quality, product category), which would provide a more comprehensive account of the income-generation process and identify conditions under which e-commerce adoption yields larger or smaller income gains.

Fifth, future studies should investigate platform-specific income effects distinguishing between Shopee, TikTok Shop, Tokopedia, Lazada, and other platforms as different platforms' algorithmic, fee, and promotional structures may generate systematically different income outcomes for ornamental plant MSMEs. Understanding which platforms deliver the greatest income returns for specific product categories and MSME scales would enable more targeted adoption guidance.

## **5.3 Suggestions and Directions for Future Research**

Future research is recommended to expand the sample size and include MSMEs from multiple regions to improve generalizability. Longitudinal or panel data designs should be considered to examine the long-term causal impact of e-commerce adoption on income growth. Researchers are encouraged to incorporate additional variables such as digital literacy, business capital, innovation capability, and logistics infrastructure to develop a more comprehensive model. Future studies may also compare different e-commerce platforms to identify platform-specific effects on MSME performance and explore mediating variables such as market reach, customer engagement, and transaction efficiency.

This study involves three authors with distinct but complementary contributions. RIR served as the main contributor, responsible for developing the research concept, designing the methodology, conducting field data collection, and preparing the initial manuscript draft. Y acted as the supervisor and principal reviewer, providing research oversight, validating the methodology, and offering critical input throughout the revision and refinement process until the final stage of the manuscript. Meanwhile, JI contributed by supporting data analysis, assisting in the interpretation of statistical results, and performing manuscript editing and review to ensure academic quality and readability. All authors have approved the final version of the manuscript and are fully accountable for all aspects of the publication.

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