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The Impact of QRIS Adoption on Revenue Growth and Cost Efficiency of Micro and Small Enterprises in Yogyakarta: Evidence from a Panel Data Analysis

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Abstract: *This study investigates the impact of QRIS adoption on revenue growth and cost efficiency of micro and small enterprises in Yogyakarta using a panel data approach. Micro and small enterprises play a critical role in regional economic development, yet many still rely on conventional cash transactions. The introduction of QRIS as a standardized digital payment system aims to enhance transaction efficiency and financial inclusion. However, empirical evidence on its measurable economic impact at the firm level remains limited. This research employs a quantitative design using balanced panel data from 162 micro and small enterprises observed over a three year period from 2022 to 2024. The study applies Fixed Effects regression and Difference in Differences estimation to identify the causal impact of QRIS adoption on annual revenue growth and operational cost efficiency. Revenue growth is measured as the percentage increase in annual sales, while cost efficiency is proxied by the ratio of operational costs to revenue. The results indicate that QRIS adoption significantly increases annual revenue growth by approximately 6 to 7 percentage points. In addition, QRIS adoption significantly reduces operational cost ratios by about 5 percentage points, reflecting improved cost efficiency. The findings remain robust after controlling for firm age, firm size, and digital literacy. Digital literacy further strengthens performance outcomes, indicating that technological capability enhances the benefits of adoption. The study concludes that QRIS adoption contributes positively to financial performance and operational efficiency of micro and small enterprises in Yogyakarta. Digital payment integration functions not only as a transaction tool but also as a strategic instrument that supports productivity, competitiveness, and sustainable business growth.*

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INTRODUCTION

Micro and small enterprises (MSEs) are pivotal to economic development in emerging economies. These firms contribute significantly to employment, income generation, and local economic resilience. The rapid rise of digital financial technologies has reshaped the way MSEs transact and manage finances. Digital payment adoption is increasingly regarded as a catalyst for growth and operational improvement among small business owners, particularly in cash-intensive markets (Annisa et al., 2024; Raza, 2025). Understanding the impact of digital payment adoption on revenue growth and cost efficiency is essential for policy design and business strategy.

In Indonesia, the national QR code standard for payments, known as QRIS (Quick Response Code Indonesian Standard), was introduced to unify digital payment channels and promote interoperability across financial service providers. The adoption of QRIS aims to streamline payment processes, reduce dependency on cash, and expand financial inclusion among informal and formal microenterprises (Suseno, 2025; Isma Nurrokhim et al., 2025). Early evidence indicates that QRIS

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offers operational improvements by simplifying payment receipts and expanding customer access (Pertiwi & Raflah, 2025; Kencanawati et al., 2025).

The potential of QRIS adoption to influence revenue growth stems from enhanced customer convenience, broader market outreach, and integration into the digital economy. Research in urban contexts shows that adoption of digital payment systems can increase sales volume and customer traffic, thereby contributing to higher turnover and profitability for small retailers (Rahmawaty et al., 2025; Angelicia et al., 2023). Such findings align with global insights where digital payment uptake results in measurable increases in income and operational scale among small firms (Annisa et al., 2024; Paul, 2025).

Cost structures of MSEs are critically affected by payment methods. Manual cash handling involves time-consuming procedures, risk of error, and costs related to security and reconciliation. Digital payments reduce these frictions by offering instant settlement, automated record keeping, and lower cash management expenses (Zakariya & Arifin, 2025; Yudianto & Latte, 2026). This improvement in cost efficiency is particularly valuable for microenterprises operating with narrow profit margins where even slight savings in transaction costs can significantly affect net income (Raza, 2025; Agustiani & Anfas, 2025).

The theoretical foundation for studying technology adoption effects on business outcomes is grounded in accepted frameworks such as the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). These models posit that perceived usefulness and ease of use drive adoption intentions, which subsequently influence business performance outcomes (Lolowang et al., 2024; Badrawani, 2025). Empirical applications of TAM to digital payment adoption demonstrate that microbusiness owners who perceive QRIS as beneficial and accessible are more likely to integrate it into their operations, leading to improved financial and operational results (Lolowang et al., 2024; Wardhani et al., 2023).

Despite these theoretical underpinnings, there remains a lack of longitudinal and quantitative evidence on how QRIS adoption directly translates into revenue growth and cost efficiency among MSEs. Most studies to date have relied on cross-sectional surveys or qualitative assessments, limiting their ability to infer causal relationships (Annisa et al., 2024; Suseno, 2025). This gap is particularly salient in regional economies such as Yogyakarta, where small firms play a substantial economic role and digital payments are increasingly embedded in consumer behavior.

Research on digital payment platforms outside Indonesia underscores the broader relevance of such technologies. In India, for instance, Unified Payments Interface (UPI) has dramatically transformed small business operations by reducing settlement times and transaction costs, while also expanding customer access to cashless transactions (Paul, 2025; Economic Times, 2025). These outcomes suggest that interoperable digital payments can create scalable benefits for small merchants in diverse contexts.

In addition to transaction cost considerations, digital payments generate transaction data trails that improve financial transparency and record keeping. Access to accurate financial records strengthens eligibility for formal financing options and enhances creditworthiness, which can further support business expansion (Annisa et al., 2024; Yudianto & Latte, 2026). As MSEs transition from informal cash operations to digital platforms, financial traceability and access to financial services are critical enablers of sustained growth.

However, barriers to QRIS adoption persist. Digital literacy remains uneven among business owners, with smaller and rural enterprises often experiencing difficulties in navigating digital interfaces or interpreting payment data (Suseno, 2025; Pertiwi & Raflah, 2025). Infrastructure

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constraints, such as limited internet connectivity, also impede seamless digital payment usage in certain regions. These obstacles can reduce the realized benefits of QRIS and mitigate its overall impact on revenue and cost outcomes (Agustiani & Anfas, 2025; Yudianto & Latte, 2026).

Additionally, the role of consumer behavior cannot be underestimated. The convenience and security perceptions held by customers influence their payment choices, which in turn affect the utility of digital payment systems for businesses (Rahmawaty et al., 2025; Putri et al., 2024). In markets where consumers increasingly favor cashless transactions, failure to adopt digital payment options such as QRIS may result in diminished market relevance and lost revenue opportunities (Annisa et al., 2024; Raza, 2025).

Small enterprises also face cost considerations related to merchant fees and integration expenses. Although QRIS standardizes payment acceptance across providers, charges such as merchant discount rates (MDR) and platform fees can affect the cost-benefit calculus for microbusiness owners (Pertiwi & Raflah, 2025; Zakariya & Arifin, 2025). These costs must be weighed against the potential gains from increased sales and operational efficiency to determine net impact.

To address these complexities, panel data analysis offers an empirical tool to discern how QRIS adoption affects revenue and cost efficiency over time. By tracking firms that adopt QRIS and comparing their performance trajectories with those that do not, researchers can isolate the effects of digital payment adoption from other confounding influences. Such analysis is critical to generate evidence that informs policymakers, financial institutions, and business support organizations about the true economic impacts of digital payment systems like QRIS.

This study focuses on MSEs in Yogyakarta, a regional economic hub with a vibrant microenterprise ecosystem. Evidence from panel data provides insights into whether QRIS adoption correlates with improved revenue growth and enhanced cost efficiency. This localized focus also contributes to the broader literature by offering context-specific evidence from Indonesia, complementing international studies on digital payments and small business performance.

In summary, the adoption of QRIS represents a significant innovation in the digital transformation of MSEs. Early research suggests benefits in transaction efficiency, expanded market reach, and improved financial performance. However, empirical research that rigorously quantifies these effects over time remains limited. Examining the impacts of QRIS adoption on revenue growth and cost efficiency in Yogyakarta can provide essential evidence to guide policy interventions and business strategies that support the sustainable growth of micro and small enterprises.

RESEARCH METHOD

Research Design

This study applies a quantitative approach using panel data analysis to examine the impact of QRIS adoption on revenue growth and cost efficiency of micro and small enterprises in Yogyakarta. A panel design allows observation of the same business units across multiple time periods. This design strengthens causal inference because it controls for unobserved heterogeneity that remains constant over time (Baltagi, 2021; Wooldridge, 2019).

Panel data methods are widely used in small business and financial technology research because they capture both cross sectional and temporal variation in firm performance (Hsiao, 2022;

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Li & Wu, 2023). Unlike cross sectional analysis, panel regression reduces omitted variable bias and improves efficiency of estimators. It also enables tracking performance changes before and after technology adoption (Greene, 2018; Wooldridge, 2019).

The study adopts a quasi experimental framework. QRIS adoption serves as the treatment variable. Firms that adopted QRIS during the observation period form the treatment group. Firms that did not adopt QRIS form the control group. This approach aligns with prior research evaluating digital payment impacts on small enterprise performance (Wardhani et al., 2023; Rahmawaty et al., 2025).

Population and Sampling

The population consists of registered micro and small enterprises operating in Yogyakarta Province. The sample includes firms from trade, food and beverage, services, and small retail sectors. These sectors show high transaction frequency and direct exposure to consumer payment preferences.

A purposive sampling strategy is used. Firms must meet three criteria. First, they operate continuously during the observation period. Second, they maintain basic financial records including monthly revenue and operational costs. Third, they either adopted QRIS during the study period or have not adopted it at all.

Sample size determination follows minimum panel data requirements to ensure reliable estimation. Econometric literature suggests that panel datasets should balance number of firms and time periods to improve estimator precision (Baltagi, 2021; Hsiao, 2022). This study targets at least 150 firms observed over a three year period, generating a minimum of 450 firm year observations.

Data Sources and Collection

The study uses secondary and primary data. Secondary data include firm revenue records, operational costs, and QRIS adoption status obtained from local cooperative offices and participating financial institutions. Primary data are collected through structured questionnaires to verify adoption timing, business characteristics, and control variables.

Revenue growth is calculated from annual percentage change in total sales. Cost efficiency is measured using the ratio of operational costs to total revenue. Lower ratios indicate higher efficiency. Similar indicators are used in empirical studies on digital finance and small firm performance (Li & Wu, 2023; Yudianto & Latte, 2026).

Control variables include firm age, number of employees, sector category, owner education level, and access to digital infrastructure. These variables are commonly associated with business performance and technology adoption outcomes (Annisa et al., 2024; Agustiani & Anfas, 2025).

Variables and Measurement

The dependent variables are:

1. Revenue Growth (RG). Measured as annual percentage increase in sales revenue.
2. Cost Efficiency (CE). Measured using the operational cost to revenue ratio.

The main independent variable is:

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• **QRIS Adoption (QRIS_it)**

A binary variable equal to 1 if firm i adopts QRIS in year t, and 0 otherwise. Additional independent variables include digital literacy index, firm size, and capital intensity. Technology adoption literature highlights the importance of perceived usefulness, ease of use, and digital capability in determining performance outcomes (Davis, 1989; Venkatesh et al., 2003; Lolowang et al., 2024).

Econometric Model

The study estimates two primary regression models:

Model 1: Revenue Growth Model

$RG_{it} = \alpha + \beta 1\ QRIS_{it} + \beta 2\ X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Model 2: Cost Efficiency Model

$CE_{it} = \alpha + \beta 1\ QRIS_{it} + \beta 2\ X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$

Where:

- i represents firm
- t represents year
- X_{it} represents control variables
- μ_i captures firm specific effects
- λ_t captures time effects
- ε_{it} is the error term

The study estimates both Fixed Effects (FE) and Random Effects (RE) models. The Hausman test determines the appropriate specification (Wooldridge, 2019; Baltagi, 2021). Fixed effects control for time invariant firm characteristics such as managerial style or location. To strengthen causal inference, a Difference in Differences approach is also applied for firms that adopt QRIS during the study period. This method compares performance changes before and after adoption between treated and untreated firms (Angrist & Pischke, 2015; Li & Wu, 2023).

Validity and Reliability

The study ensures construct validity by using established financial performance indicators. Revenue growth and cost ratios are standard metrics in small enterprise research (Wardhani et al., 2023; Rahmawaty et al., 2025). Data reliability is verified through cross checking financial records with questionnaire responses. Outliers are treated using winsorization to minimize distortion. Multicollinearity is tested using variance inflation factor. Heteroskedasticity is corrected using robust standard errors (Wooldridge, 2019).

Ethical Considerations

All participating firms provide informed consent. Financial data are anonymized to protect confidentiality. The study follows research ethics guidelines for social science research involving business entities.

Analytical Software

Data processing and econometric estimation are conducted using statistical software such as Stata and R. These platforms support panel regression and difference in differences estimation with robust standard errors (Hsiao, 2022; Baltagi, 2021).

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RESULTS AND DISCUSSION

Descriptive Statistics

This study analyzes 162 micro and small enterprises in Yogyakarta observed over a three year period from 2022 to 2024. The balanced panel structure produces 486 firm year observations. Of the total firms, 87 adopted QRIS during the observation period, while 75 did not adopt QRIS. Adoption increased steadily each year, reflecting expanding digital payment penetration among small enterprises.

Table 1 presents descriptive statistics of the main variables. On average, firms that adopted QRIS recorded higher revenue growth and lower cost to revenue ratios compared to non adopters. The average annual revenue growth of adopters reached 14.8 percent, while non adopters recorded 8.3 percent. The mean operational cost ratio of adopters was 0.62, compared to 0.71 for non adopters. These preliminary patterns indicate that QRIS adoption may be associated with stronger financial performance.

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Revenue Growth (%)	11.62	7.45	-5.20	32.10
Cost Efficiency (Cost/Revenue)	0.66	0.12	0.41	0.92
QRIS Adoption (1=Yes)	0.54	0.50	0	1
Firm Age (years)	6.8	4.2	1	21
Number of Employees	4.3	2.1	1	12
Digital Literacy Index	3.7	0.8	2.1	5.0

The descriptive results align with previous findings that digital payment adoption correlates with improved sales and transaction efficiency among micro enterprises (Wardhani et al., 2023; Rahmawaty et al., 2025).

Panel Regression Results

To estimate the impact of QRIS adoption on revenue growth and cost efficiency, both Fixed Effects and Random Effects models were estimated. The Hausman test rejected the null hypothesis of no systematic difference between estimators, indicating that the Fixed Effects model is more appropriate (Wooldridge, 2019; Baltagi, 2021). Therefore, the discussion focuses on Fixed Effects results.

Table 2. Fixed Effects Regression Results

Variable	Revenue Growth Model (β)	Cost Efficiency Model (β)
QRIS Adoption	0.067*** (0.015)	-0.054*** (0.012)
Firm Age	0.004 (0.003)	-0.006* (0.003)
Employees	0.011** (0.005)	-0.008** (0.004)
Digital Literacy	0.023** (0.010)	-0.019** (0.008)
Constant	0.031	0.742
Observations	486	486
R^2	0.41	0.38

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Note: Standard errors in parentheses.

• $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The coefficient of QRIS adoption in the revenue growth model is positive and statistically significant at the 1 percent level. The magnitude of 0.067 indicates that adoption is associated with a 6.7 percentage point increase in annual revenue growth. This result confirms that digital payment integration enhances firm turnover.

The cost efficiency model shows a negative and significant coefficient of -0.054. Since cost efficiency is measured as cost to revenue ratio, a negative coefficient indicates improved efficiency. QRIS adoption reduces operational cost ratio by 5.4 percentage points on average.

These results provide strong empirical evidence that QRIS adoption contributes to both higher revenue growth and lower operational cost burden. The findings support earlier research indicating that digital payments improve transaction speed, reduce reconciliation costs, and expand customer access (Annisa et al., 2024; Yudianto & Latte, 2026).

Difference in Differences Analysis

To strengthen causal inference, a Difference in Differences model was estimated for firms that adopted QRIS during the study period. The interaction term between treatment group and post adoption period is positive and significant in the revenue model, and negative and significant in the cost model. The DiD results show that after adoption, treated firms experienced an average revenue increase of 7.4 percentage points relative to non adopters. Operational cost ratios declined by 4.9 percentage points after adoption. These results reinforce the panel regression findings and reduce concerns of reverse causality (Angrist & Pischke, 2015).

Discussion

The results confirm that QRIS adoption plays a significant role in improving financial performance of micro and small enterprises in Yogyakarta. The positive effect on revenue growth reflects expanded customer reach and enhanced transaction convenience. Consumers increasingly prefer cashless payment options. Firms that accept QRIS can capture these transactions more effectively. Similar outcomes have been documented in Indonesian MSME contexts (Wardhani et al., 2023; Rahmawaty et al., 2025).

Digital payment systems reduce transaction friction. Faster settlement improves cash flow stability. Improved liquidity enables firms to restock inventory more quickly and respond to demand fluctuations. This dynamic supports revenue expansion. Research in digital finance highlights that improved transaction infrastructure strengthens business resilience and growth potential (Li & Wu, 2023; Raza, 2025).

Cost efficiency improvements emerge from lower cash handling expenses and automated bookkeeping. Manual cash management requires labor time, physical security, and reconciliation processes. QRIS transactions automatically generate digital records. This reduces administrative workload and accounting errors. These mechanisms explain the significant reduction in cost to revenue ratio observed in this study. Similar efficiency gains were reported in studies on digital payment adoption in micro enterprises (Yudianto & Latte, 2026; Agustiani & Anfas, 2025).

Digital literacy also shows a significant positive relationship with revenue growth and cost efficiency. This suggests that technological capability enhances the effectiveness of QRIS usage. Technology adoption theory emphasizes perceived usefulness and ease of use as drivers of performance outcomes (Davis, 1989; Venkatesh et al., 2003). Firms with higher digital literacy leverage QRIS features more effectively, including transaction tracking and sales analysis tools.

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Firm size measured by number of employees positively affects revenue growth and efficiency. Larger micro enterprises may possess better organizational capacity to integrate digital systems. This aligns with empirical findings that internal resources shape digital transformation outcomes (Annisa et al., 2024; Li & Wu, 2023).

The findings also reveal that older firms exhibit slightly improved cost efficiency. Experience may contribute to better financial management practices. However, firm age does not significantly influence revenue growth once QRIS adoption is accounted for. This indicates that digital transformation plays a stronger role in performance variation than organizational maturity.

From a policy perspective, these results validate efforts to expand QRIS adoption among micro and small enterprises. Digital payment infrastructure can serve as a tool for inclusive economic growth. By lowering transaction barriers and enhancing transparency, QRIS contributes to productivity and competitiveness of small firms. Studies on national digital payment strategies highlight similar macroeconomic benefits (Raza, 2025; Li & Wu, 2023).

However, adoption alone is not sufficient. Complementary factors such as digital literacy, reliable internet connectivity, and consumer awareness are essential. Without these supports, performance gains may remain limited. Research on technology diffusion emphasizes that ecosystem readiness determines the magnitude of economic benefits (Venkatesh et al., 2003; Annisa et al., 2024).

The study has several implications. First, financial institutions should provide training programs to enhance merchant digital capability. Second, policymakers should maintain low transaction fees to preserve efficiency gains. Third, local governments can integrate QRIS promotion into MSME development strategies.

Despite robust findings, limitations exist. The study focuses on Yogyakarta. Results may differ in regions with lower digital penetration. The observation period spans three years. Longer panel duration could capture dynamic effects more precisely. Future research may explore heterogeneous impacts across sectors or gender of business owners.

Overall, the empirical evidence demonstrates that QRIS adoption significantly improves revenue growth and cost efficiency among micro and small enterprises in Yogyakarta. The findings contribute to the literature on digital finance and small business performance by providing longitudinal panel evidence. Digital payment systems are not merely transactional tools. They represent strategic assets that enhance operational productivity and financial sustainability.

CONCLUSION

This study examines the impact of QRIS adoption on revenue growth and cost efficiency of micro and small enterprises in Yogyakarta using panel data analysis. By employing a fixed effects model and Difference in Differences approach, the research provides empirical evidence on the performance implications of digital payment integration at the firm level. The findings confirm that QRIS adoption generates measurable economic benefits for micro and small enterprises.

First, QRIS adoption significantly increases revenue growth. Firms that implemented QRIS experienced higher annual sales growth compared to non adopters. The panel regression results show that adoption is associated with an average increase of approximately 6 to 7 percentage points in annual revenue growth. This improvement reflects enhanced transaction convenience, broader customer reach, and improved cash flow management. Digital payment acceptance enables firms to capture cashless consumer demand and reduce transaction barriers. The results

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support technology adoption theory, which emphasizes perceived usefulness as a driver of organizational performance (Davis, 1989; Venkatesh et al., 2003).

Second, QRIS adoption improves cost efficiency. The operational cost to revenue ratio declines significantly after adoption. This indicates that digital transactions reduce cash handling costs, minimize administrative burdens, and improve financial recording accuracy. Automated transaction documentation reduces time spent on reconciliation and lowers the risk of human error. These mechanisms strengthen operational productivity and profitability.

Third, complementary factors such as digital literacy and firm size enhance the positive impact of QRIS adoption. Firms with higher digital capability leverage QRIS more effectively. Organizational capacity and internal resources influence how technology adoption translates into financial outcomes. This finding highlights that digital transformation requires both technological access and human capital readiness.

The study contributes to the literature on digital finance and small business performance by providing longitudinal panel evidence from a regional Indonesian context. Unlike cross sectional studies, this research isolates time invariant firm characteristics and strengthens causal interpretation. The findings demonstrate that QRIS is not merely a payment instrument but a strategic tool that improves revenue dynamics and operational efficiency.

Overall, QRIS adoption supports financial sustainability and competitiveness of micro and small enterprises in Yogyakarta. Expanding digital payment infrastructure, strengthening merchant digital literacy, and maintaining supportive regulatory frameworks are essential to maximize economic benefits. Digital payment integration represents a practical pathway toward inclusive and productivity driven growth in the microenterprise sector.

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