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University Education and Innovation Resistance: A Multigroup Analysis of Digital Payment Barriers among Indonesian Farmers

Muhammad Nurjihadi[1], Othman Ibrahim[2], Sahat M Pasaribu[3]

[1]Azman Hashim International Business School, UTM, Malaysia, [2]Department of Information System, UTM, Malaysia, [3]Research Center for Economic of Industry, services, and Trade, BRIN, Indonesia

Email: muhammadnurjihadi@graduate.utm.my, othmanibrahim@utm.my, sahatp@gmail.com

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Abstract

This study investigates the moderating role of university education in the relationship between risk, usage, value, tradition, and image barriers and farmers' resistance to digital payment systems in Indonesia. Data were collected from 316 farmers across different regions using a survey method, and the analysis was conducted through Multigroup Analysis (MGA) in Structural Equation Modeling (SEM-PLS). The results indicate that university education significantly moderates the relationship between risk barriers and resistance, with risk barriers exerting a stronger influence among highly educated farmers. However, university education did not moderate the relationships between other barriers and resistance. These findings suggest that while higher education increases risk awareness, other forms of resistance are consistent across educational levels. The study highlights the need for tailored strategies to address risk concerns among educated farmers and simplified approaches for less-educated ones, providing valuable insights for policymakers and stakeholders in promoting digital payment adoption.

Keywords: University Education, Digital Payment, Resistance, Farmers, Multigroup Analysis

Introduction

Agriculture plays a crucial role in the economic and social fabric of Indonesia (World Bank, 2022), with approximately 30% of the nation's workforce engaged in farming activities (BPS, 2023). The sector, however, faces challenges in productivity and efficiency that are increasingly being addressed through digital advancements, including the use of digital payment systems. The integration of digital payments in agriculture promises to streamline transactions, reduce costs, and improve access to markets and financial services (APEC, 2017). Yet, the adoption of such technologies by farmers is still relatively low due to resistance.

Resistance to digital payment systems among farmers can be attributed to various factors, including perceived risks, incompatibility with social norm and current practices, lack of perceived benefit and the complexity of new technology. The Innovation Resistance Theory

(IRT) provides a framework for understanding these challenges, suggesting that individuals resist adopting innovations due to perceived threats to their established routines and values (Tansuhaj *et al.*, 1991). Previous research using IRT has identified factors such as usage barriers, value barriers, risk barriers, tradition barriers, and image barriers as significant determinants of resistance in various contexts, including digital payment systems (Sivathanu, 2017; Kaur *et al.*, 2020).

While IRT focuses on these barriers, it does not fully account for how socio-demographic factors might shape resistance behaviour. One of the key socio-economic variables that can significantly influence individuals' behaviour toward innovation is education, particularly university education. Education shapes individuals' cognitive abilities, critical thinking, and openness to new technologies, potentially reducing barriers to adoption (Weir and Knight, 2004). There have been long records on the effectiveness of education in improving rural wellbeing and help farmers out of poverty due to the ability of education to increase skills, knowledges, and social capital (Paraschiv, 2017; Eryong and Xiuping, 2018). In the context of this study, university education may empower farmers with the knowledge and skills needed to evaluate and trust digital payment systems, thereby lowering resistance. Educated farmers are potentially more receptive to the benefits of digital payment systems, better equipped to navigate their complexities, and more likely to influence their peers in adopting such technologies. However, there is a dearth of studies examining the role of educational background in shaping resistance behaviour, particularly in the agricultural sector.

This research seeks to fill this gap by exploring whether university education matters in farmers' resistance toward digital payment systems. By conducting a multigroup analysis in the Indonesian context, this study aims to provide empirical evidence on the impact of education on innovation resistance, contributing to the broader discourse on technology adoption in agriculture. Understanding this relationship is essential for policymakers and stakeholders to develop targeted interventions that foster the adoption of digital technologies in the agricultural sector, thereby enhancing productivity and sustainability.

The objective of this research is to investigate the role of university education in influencing farmers' resistance to adopting digital payment systems in the agricultural sector in Indonesia. Through this research, we aim to contribute to the understanding of technology adoption in agriculture and to inform the development of targeted strategies that encourage the use of digital payment systems among farmers.

Literature Review

Innovation Resistance Theory (IRT)

The Innovation Resistance Theory (IRT), developed by Ram and Sheth (1989), offers a framework for understanding why individuals resist adopting new innovations, despite their advantages. IRT builds on the Innovation Diffusion Theory (IDT) by focusing on the barriers people face in adopting innovations, such as usage, value, risk, tradition, and image barriers (Talwar *et al.*, 2023). IRT has been widely used in various contexts, including resistance to digital payment systems, online learning, and online marketplaces, as explored by studies such as Lian *et al.* (Lian and Yen, 2013), Ma and Lee (Ma and Lee, 2019), and Kaur *et al.* (2020). Research has consistently identified perceived risk and value as major factors contributing to resistance (Ma and Lee, 2019; Kaur *et al.*, 2021), with other barriers such as usage, image, and tradition also playing significant roles (Ghosh, 2022). Moreover, recent studies have extended the IRT framework by incorporating variables like demographic characteristics, environmental awareness, and resistance to change.

Usage Barriers (UB)
Usage barriers refer to the perceived difficulties and challenges individuals face when attempting to use a new technology or innovation (Laukkanen, 2015). These barriers typically arise when the innovation does not align with users' current habits, needs, or levels of familiarity. In the context of digital payment systems, usage barriers can include concerns about the complexity of the technology, lack of user-friendly interfaces, or the need for technical skills (Sivathanu, 2017) that may be beyond the capability of certain user groups, such as farmers. Ram and Sheth (1989), emphasized that if individuals find an innovation difficult to use or understand, they are more likely to resist its adoption, regardless of its potential benefits.

In this study, usage barriers are particularly relevant in examining the resistance of farmers to adopting digital payment systems. Farmers, especially those with limited digital literacy or exposure to technology, may perceive digital payments as overly complicated or inconsistent with their established financial practices, leading to resistance (Klyton *et al.*, 2021). The level of education, particularly university education may play a critical role in mitigating these barriers. Akinyemi and Mushunje (2020) found that level of education played significant role in determining mobile money adoption in Africa. University-educated farmers might be more adept at navigating the technical aspects of digital payment systems, thus experiencing fewer usage barriers compared to those without higher education. Therefore, we hypothesized that the relationship between the usage barriers and resistance of digital payment among farmers are moderated by their university education attainment.
H1: The relationship between usage barriers and resistance toward digital payment adoption is weaker for farmers with university education attainment

Value Barriers (VB)
Value barriers emerge when potential users perceive the innovation as lacking in added value compared to the alternatives they are already using (Behera *et al.*, 2022). This occurs when the benefits of adopting the innovation are not immediately clear or do not justify the effort, time, or cost involved (Leong *et al.*, 2021). In the context of digital payments, value barriers may arise if farmers believe that traditional payment methods, such as cash transactions, serve their needs adequately and see no compelling advantage in switching to digital platforms (Cham *et al.*, 2021). Factors such as transaction fees, availability of bonuses, and the perception that the current systems work efficiently for their specific agricultural practices can heighten these value barriers.

The moderating role of university education becomes critical in this context. Farmers with university education are likely to possess a greater awareness of the potential long-term benefits of digital payments, such as increased efficiency, reduced risk of fraud, and better financial management (Weir and Knight, 2004). Educated farmers may be more open to recognizing the broader economic and operational advantages that digital payments can bring, such as access to larger markets or streamlined payment processes (Zhu *et al.*, 2021). This contrasts with farmers who have not received a university education, as they may be

more focused on the immediate costs or learning curves involved, potentially seeing little value in making the transition. As a result, this study proposed a hypothesis that the effect of VB on resistance toward digital payment is moderated by the farmers ability to obtain university education.
H2: The relationship between value barriers and resistance toward digital payment adoption is weaker for farmers with university education attainment

Risk Barriers (RB)
Risk barriers in IRT refers to the perceived uncertainties and potential negative consequences that individuals associate with adopting a new technology (Laukkanen, 2015). In the case of digital payment systems, these risks might include concerns about the security of online transactions, fear of financial loss due to fraud, system failures, or the potential misuse of personal and financial information (Cham *et al.*, 2021). Farmers, especially in rural areas, may be particularly cautious about embracing digital payments, fearing that these systems could expose them to risks they are unfamiliar with, thus leading to resistance.

University education could play a significant moderating role in addressing these risk barriers. Educated farmers are generally more familiar with digital technology and financial systems, which may enable them to better assess and manage perceived risks (Zhu *et al.*, 2021). They may also have greater access to information regarding the safety measures and safeguards that digital payment systems employ, such as encryption, fraud detection, and regulatory protections (Akinyemi and Mushunje, 2020). This increased awareness can reduce fear and uncertainty, leading university-educated farmers to perceive lower risks compared to their less-educated counterparts. Consequently, this study expects that the effect of risk barriers on resistance toward digital payment is moderated by the university education attainment of the farmers.
H3: The relationship between risk barriers and resistance toward digital payment adoption is weaker for farmers with university education attainment

Tradition Barriers (TB)
Tradition barriers, within the framework of IRT, refer to resistance that arises when a new technology or innovation conflicts with established cultural norms, values, and long-standing practices (Klyton *et al.*, 2021). In the context of digital payment systems, tradition barriers can be particularly significant among farmers, many of whom may be accustomed to conventional cash-based transactions (Cham *et al.*, 2021), often passed down through generations. These farmers may view digital payments as a disruption to their familiar practices, preferring to stick with trusted, face-to-face dealings that align with their social and cultural norms. The inertia toward adopting new technologies can be strong when traditions deeply influence daily operations.

University education has the potential to moderate the impact of tradition barriers on digital payment resistance in the agricultural society. Educated farmers are more likely to have been exposed to new ideas, practices, and technologies through their academic experiences, making them more open to considering alternatives to traditional methods (Weir and Knight, 2004). They may better understand the benefits of adopting modern digital payment systems, such as enhanced transparency, faster transactions, and easier record-keeping, which can improve overall productivity. As a result, university education might reduce the attachment

to traditional payment methods, making educated farmers more willing to embrace digital innovation despite long-standing customs. Digital payment adoption was found to be more significant in society with higher level of education (Akinyemi and Mushunje, 2020; Zhu *et al.*, 2021). Thus, we hypothesized that the university education attainment of farmers moderate the relationship between tradition barriers and resistance toward digital payment.
H4: The relationship between tradition barriers and resistance toward digital payment adoption is weaker for farmers with university education attainment

Image Barriers (IB)
Image barriers in IRT refer to the negative perceptions or stigmas associated with adopting a particular innovation (Talwar *et al.*, 2023). In the context of digital payment systems, these barriers can emerge when farmers perceive digital payments as unsuitable or misaligned with their identity, social status, or the image they project within their communities (Behera *et al.*, 2022). For instance, in traditional farming communities, using cash might be seen as a symbol of trust and direct relationships, while embracing digital payments may be viewed as too modern or impersonal, creating resistance due to concerns about how they will be perceived by peers and the broader community.

University education can play a moderating role in reducing image barriers by enhancing awareness and altering perceptions about digital technologies (Weir and Knight, 2004). Educated farmers are likely to have a broader perspective on the benefits of digitalization, understanding that the adoption of digital payment systems reflects modernity and efficiency, rather than alienating traditional values. Exposure to different environments and technologies through higher education can help mitigate the fear of social judgment, allowing educated farmers to view digital payments as a tool for improving productivity and connecting with larger markets, rather than a threat to their social image. For this reasons, we expect that farmers ability to obtain university education moderate the effect of image barriers on resistance toward digital payment.
H5: The relationship between image barriers and resistance toward digital payment adoption is weaker for farmers with university education attainment

Multigroup Analysis
Multigroup Analysis (MGA) in Structural Equation Modeling using Partial Least Squares (SEM-PLS) is an essential method for understanding whether relationships between variables differ across distinct groups (Cheah *et al.*, 2023). This technique allows researchers to examine heterogeneity in their data, which is crucial when investigating whether a certain factor, such as education, significantly moderates the relationship between other variables. In this study, MGA is employed to assess whether the effect of innovation resistance factors, such as usage, value, risk, tradition, and image barriers, varies between farmers with and without university education. This analysis is pivotal in determining the moderating role of education in the adoption of digital payments within the agricultural sector in Indonesia.

The importance of MGA in academic literature stems from its ability to uncover group-specific differences that would otherwise be masked in a single-group analysis. Scholars have increasingly applied MGA in diverse research fields, including marketing, psychology, and technology adoption, particularly when demographic or contextual variables (e.g., age, gender, education) are expected to play a moderating role (Cheah *et al.*, 2020). By analysing multiple groups simultaneously, MGA provides a more nuanced understanding of the dynamics at play across different subpopulations.

This methodological approach not only enriches the theoretical understanding of resistance to innovation but also guides policymakers and practitioners in designing tailored strategies that address the specific needs and concerns of different farmer segments. By doing so, MGA contributes to achieving the study's objective of exploring the role of university education in shaping resistance to digital payments among Indonesian farmers.

Methods and Instruments

This study employed a survey-based methodology targeting farmers in Indonesia who have experience in using digital payment systems. The survey aimed to identify the factors influencing these farmers' resistance to use digital payment systems in their agricultural business and how university education attainment moderate the influence. To ensure a comprehensive and diverse sample, the study targeted farmers across various regions in Indonesia, resulting in a total of 396 participants. A self-registration sampling method was used, with invitations to participate extended through multiple channels. After filtering the respondents eligibility, only 316 responses were used in analysis of this study.

The survey instrument was meticulously developed based on a thorough review of relevant literatures to ensure it adequately captured the constructs being measured. The main literatures used as benchmarks include Sivathanu (2017), Ghosh (2022), and Behera *et al.* (2022). To validate the instrument, a panel that consists of five experts in this field reviewed the instrument to confirm its content validity and reliability (the results are provided in table 1). The survey was distributed online using Allcounted.com, a platform that facilitates efficient data collection and management. To ensure that the questionnaire reach wider population target of farmers, trained enumerators were hired to distribute the questionnaire offline.

The data collected from the survey were analysed using Structural Equation Modeling (SEM) with the SmartPLS application, focusing on the Multigroup Analysis (MGA). Before conducting the MGA, measurement invariance was established to ensure the reliability and validity of the findings across different groups. SEM-PLS is used in a study with a predictive nature, while CB-SEM is recommended for study with explanatory nature (Hair Jr. *et al.*, 2017). As this study is predictive in nature, SEM-PLS is employed, focusing on the MGA.

Table 1
Instrument development results

No	Variable	Questionnaire items No	Questionnaire items items	Reference
1	Usage Barrier	1	I feel that digital payment systems are difficult to use for transaction in agricultural activities.	Behera et al., 2022; Laukkanen, 2015; Sivathanu, 2017; Migliore et al., 2022
		2	I feel that the use of digital payment systems is not user-friendly for agricultural transactions.	
		3	I perceive that digital payment systems are not faster for conducting agricultural business.	
		4	I find the development of digital payment systems incomprehensible, especially in the context of agricultural business.	
		5	I perceive changing PIN codes for digital payment systems as inconvenient, particularly in the realm of agricultural business.	
2	Value Barrier	1	The use of digital payment for agricultural business is uneconomical.	Ghosh, 2022; Kaur et al., 2020; Behera et al., 2022; Laukkanen, 2015; Sivathanu, 2017
		2	I feel that digital payment systems are not suitable for financial transactions in agricultural businesses.	
		3	I feel that the use of digital payment systems is unable to improve my capability to manage financial transactions for the agricultural business on my own.	
3	Risk Barrier	1	When I make transactions in my agricultural business using a digital payment system, I am worried about the accuracy of the input information, which might result in mistakes.	Ghosh, 2022; Kaur et al., 2020; Behera et al., 2022; Laukkanen, 2015; Sivathanu, 2017
		2	While using digital payment systems in agriculture, I am anxious about the loss of connection.	
		3	When I use digital payment systems in my agricultural business, I am doubtful about incorrectly tapping the bill information.	
		4	I experience insecurity when utilizing digital payment systems for my agricultural business, particularly concerning the risk of PIN codes falling into the wrong hands.	
		5	I am fearful while using digital payment systems in my agricultural business, as a third party might gain access to my account information.	

No	Variable	Questionnaire items		Reference
		No	items	
4	Tradition Barrier	1	Using cash for payments in my agricultural business is a good option.	Ghosh, 2022; Kaur et al., 2020; Behera et al., 2022; Laukkanen, 2015; Sivathanu, 2017
		2	I prefer direct cash payments over digital financial services for transactions in my agricultural business.	
		3	transaction using digital payment system is not appropriate for my agricultural business	
5	Image Barrier	1	I do not have a very positive image of the digital payment system, especially for use in agriculture-based businesses.	Ghosh, 2022; Kaur et al., 2020; Behera et al., 2022; Laukkanen, 2015; Sivathanu, 2017
		2	In my opinion, the new technology of digital payment systems is often too complex to use in agricultural business.	
		3	I find digital payment systems challenging to use in agriculture.	
6	Resistance toward Digital payment system	1	I might consider using digital payment systems for my agricultural business, but not at the moment.	Ghosh, 2022; Kaur et al., 2020; Behera et al., 2022; Laukkanen, 2015; Sivathanu, 2017
		2	I will not use digital payment systems in my agricultural business.	
		3	I am strongly opposed to using digital payment systems in my agricultural business.	

Results and Discussion

Respondent Description

To better understand the context of this study, it is important to present the distribution of respondents involved in this study. The description of the 316 responses that were analysed in this research can be seen in table 2.

Table 2
Respondents Distribution

Measure	Item	Absolute	%
Gender	Male	202	64%
	Female	114	36%
Age	Gen Z (<25 y.o)	84	27%
	Millenials (>25 – 45 y.0)	143	45%
	Gen X (>45 – 60 y.o)	82	26%
	Baby boomers (> 60 y.o)	7	2%
Education	No School	3	1%
	Elementary School	33	10%
	Junior High School	39	12%
	Senior High School	116	37%
	Bachelor	112	35%
	Post Graduate	13	4%
Ethnicity by Region	Sumatra	46	15%
	Java	88	28%
	Nusa Tenggara	140	44%
	Borneo-Sulawesi	37	12%
	Maluku-Papua	5	2%
Frequency of Using Mobile phone	everyday	280	89%
	2-3 times a week	24	8%
	once a week	1	0%
	rarely	11	3%
Farming Experience	Less than 5 years	94	30%
	5-10 years	74	23%
	more than 10 years	148	47%
Farming Size	Less than 0,5 ha	100	32%
	0,5 - 1 ha	117	37%
	more than 1 ha	99	31%

Invariance Measurements

Before presenting the results of the multigroup analysis (MGA), it is essential to establish measurement invariance to ensure that our constructs are comparable across different groups of farmers based on their education levels (Cheah *et al.*, 2020). Cheah *et al.* (2023) suggested that measurement invariance is tested through three key aspects: configural invariance, compositional invariance, and composite equality of mean and variance values.

Cheah *et al.* (2023) explained that configural invariance is measured by providing information on the outer loadings, Cronbach alpha, composite reliability and the AVE for all of the measured groups. On the other hand, Compositional invariance tests whether the constructs are measured in the same way and have similar item loadings in different groups, ensuring that comparisons of latent constructs are not biased by measurement discrepancies. Furthermore, Composite equality of mean and variance values involves examining whether the mean and variance of the latent constructs met the lower (2.5%) and upper (97.5%) boundaries of confidence interval. Establishing these forms of invariance is vital to validate the MGA results, as it ensures that any observed differences in resistance to digital payment systems are attributable to real differences in the groups' responses rather than artifacts of measurement inconsistencies (Cheah *et al.*, 2020). Table 3 presents the results of the configural invariance measurement of this study.

Table 3
Configural Invariance and Model validity and reliability

	Outer Loadings			Cronbach's Alpha			Composite Reliability			Average variance extracted (AVE)		
	All	UE	Non UE	All	UE	Non UE	All	UE	Non UE	All	UE	Non UE
UB1 <- UB	0.928	0.918	0.935									
UB2 <- UB	0.924	0.918	0.928									
UB3 <- UB	0.912	0.896	0.923	0.957	0.952	0.961	0.967	0.963	0.970	0.854	0.839	0.865
UB4 <- UB	0.945	0.950	0.942									
UB5 <- UB	0.911	0.898	0.921									
VB1 <- VB	0.944	0.949	0.939									
VB2 <- VB	0.946	0.961	0.934	0.939	0.955	0.925	0.961	0.971	0.952	0.891	0.917	0.869
VB3 <- VB	0.942	0.963	0.924									
RB1 <- RB	0.860	0.847	0.859									
RB2 <- RB	0.873	0.843	0.890									
RB3 <- RB	0.902	0.888	0.907	0.938	0.922	0.944	0.953	0.941	0.957	0.801	0.763	0.817
RB4 <- RB	0.925	0.899	0.936									
RB5 <- RB	0.914	0.889	0.925									
TB1 <- TB	0.870	0.861	0.872									
TB2 <- TB	0.910	0.912	0.899	0.871	0.878	0.857	0.920	0.924	0.912	0.793	0.801	0.776
TB3 <- TB	0.892	0.911	0.871									
IB1 <- IB	0.881	0.854	0.892									
IB2 <- IB	0.922	0.911	0.925	0.885	0.870	0.888	0.929	0.920	0.930	0.813	0.794	0.816
IB3 <- IB	0.901	0.908	0.893									
Resist1 <- Resist	0.795	0.839	0.745									
Resist2 <- Resist	0.893	0.937	0.862	0.833	0.870	0.796	0.901	0.921	0.882	0.752	0.795	0.714
Resist3 <- Resist	0.909	0.895	0.919									

Hair *et al.* (2019) provided criteria on deciding the robustness of a measured model in SEM-PLS, which he pointed out that the outer loading value of all items should be more than 0.7, the Cronbach's Alpha (CA) and Composite Reliability (CR) values must also have a minimum value of 0.7, while the value of Average Variance Extracted (AVE) should be more than 0.5. Table 3 shows that the questionnaire items demonstrated robust construct representation across all groups, with outer loading values exceeding 0.8. This high outer loading indicates that the items effectively represent their respective constructs. Additionally, the reliability of the model is confirmed by its CA and CR values, both surpassing 0.7 for all constructs across all groups, indicating a strong internal consistency. Finally, the AVE values for all constructs in all groups are greater than 0.5, confirming strong convergent validity. Together, these results establish the validity and reliability of the constructs, as well as the configural invariance of the data across the different groups measured (Cheah *et al.*, 2020).

Another criteria that needs to be reported to ensure the model validity is its discriminant validity by presenting the HTMT or the Forner Lurcker Criterion results (Hair *et al.*, 2014). In this research, the Forner-Lurcker Criterion is preferred. The discriminant validity of all groups are provided in table 4 and table 5.

Table 4
Forner-Lurcker Criterion

	All					
	IB	RB	Resist	TB	UB	VB
IB	0.901					
RB	0.692	0.895				
Resist	0.771	0.626	0.867			
TB	0.720	0.620	0.672	0.891		
UB	0.632	0.646	0.624	0.550	0.924	
VB	0.698	0.687	0.703	0.604	0.832	0.944

Table 5
Forner-Lurcker Criterion for each groups

	UE						Non UE					
	IB	RB	Resist	TB	UB	VB	IB	RB	Resist	TB	UB	VB
IB	0.891						0.904					
RB	0.638	0.873					0.706	0.904				
Resist	0.750	0.678	0.891				0.774	0.573	0.845			
TB	0.745	0.681	0.661	0.895			0.689	0.557	0.655	0.881		
UB	0.602	0.648	0.631	0.570	0.916		0.650	0.645	0.617	0.533	0.930	
VB	0.627	0.666	0.703	0.611	0.871	0.958	0.742	0.696	0.698	0.588	0.802	0.932

The measured groups demonstrate strong discriminant validity within the model, as evidenced by all the selected constructs having higher cross-loadings with their designated constructs than with any other constructs. This ensures that the constructs are well-differentiated from one another (Hamid *et al.*, 2017). Given that both the reliability and validity metrics have been satisfied for all groups, configural invariance is established across all constructs.

Furthermore, the compositional invariance and the composite equality of mean and variance were also measured to ensure the invariance of the multigroup analysis. Table 6 summarized the results of the compositional invariance and the composite equality of mean and variance.

Table 6
Invariance Measurement

	Compositional Invariance			Composite Equality of Mean and Variance						
				Mean			Variance			
	Original correlation	P value	Invariance Exist	Original Difference	2.50%	97.50%	Original Difference	2.50%	97.50%	Invariance exist
UB	1.000	0.985	Yes	-0.165	-0.225	0.220	0.068	-0.280	0.232	Full invariance
VB	1.000	0.434	Yes	-0.246	-0.240	0.222	0.170	-0.267	0.241	Partial Invariance
RB	1.000	0.778	Yes	-0.378	-0.224	0.228	-0.164	-0.292	0.264	Partial Invariance
TB	1.000	0.713	Yes	-0.486	-0.222	0.215	0.043	-0.321	0.268	Partial Invariance
IB	1.000	0.798	Yes	-0.361	-0.225	0.222	-0.186	-0.307	0.258	Partial Invariance
Resist	0.999	0.339	Yes	-0.402	-0.235	0.215	0.063	-0.319	0.274	Partial Invariance

Table 6 provides rich information on the invariance measurement of this research model across different groups of the level of university educations. All constructs are confirmed to have established the configural invariance, compositional invariance, and composite equality of mean and variance. The criteria of deciding full or partial invariance is based on the value of the original difference. Full invariance are met if the original differences values on its mean and variance category are within the values of the 2.5% and 97.5% lower and upper boundaries. Meanwhile, the partial invariance is met if only one of the original difference value (whether in the mean or variance category) has the value within the 2.5% and 97.5% lower and upper boundaries. If none of the category (mean and variance) meets the criteria of lower and upper boundaries, but the composite invariance has established, the construct is considered to have partial invariance (Cheah *et al.*, 2020, 2023).

The results showed that the majority of the measured constructs have met partial invariance, only the construct of UB met the full invariance. Both full and partial invariance are considered to be acceptable in MGA. With the measurement invariance are met, the multigroup analysis can be conducted and its results can be trusted.

The Multigroup Analysis Result

In this study, Multigroup Analysis (MGA) was conducted to examine whether the relationships between innovation resistance factors—usage barriers, value barriers, risk barriers, tradition barriers, and image barriers—and resistance toward digital payment differ across two groups: farmers with university education and those without. The MGA allows for the identification of statistically significant differences in the strength of these relationships between the two groups, shedding light on the moderating role of education. As recommended by (Cheah *et al.*, 2023), the permutation MGA result is used in this study instead of the standard MGA results suggested by Henseler and Fassot (2010).

The results of the permutation MGA are presented in table 7, which outlines the original difference, p-values, and the significance of these relationships for both groups, providing key insights into how university education influences the effect of innovation barriers on resistance to digital payments.

Table 7
Multigroup Analysis Result

	Difference (UE Vs Non UE)	p value (1 tile)	p value (2 tile)	Decision
UB -> Resist	-0.152	0.883	0.235	Not Supported
VB -> Resist	0.128	0.197	0.393	Not Supported
RB -> Resist	0.277	0.023	0.046	Supported
TB -> Resist	-0.152	0.889	0.223	Not Supported
IB -> Resist	-0.064	0.664	0.671	Not Supported

The MGA result revealed that university education significantly moderates the relationship between risk barriers and resistance toward digital payment systems among farmers, with a positive difference value of 0.277. This indicates that risk barriers have a stronger effect on resistance among respondents with a university education compared to those with lower educational levels.

This result presents an unexpected finding, as we initially hypothesized that the relationship between risk barriers and resistance would be stronger among farmers without university education. However, the data reveals the opposite. One possible explanation for this anomaly could be that farmers with university education may be more aware of the complexities and potential risks associated with digital payment systems, such as data security, fraud, or system unreliability. Their heightened awareness and understanding of these risks could lead them to be more cautious or resistant compared to those without university education, who may be less familiar with or less focused on such risks. This suggests that education, while generally associated with openness to innovation, may also lead to more critical evaluations of perceived risks in technology adoption.

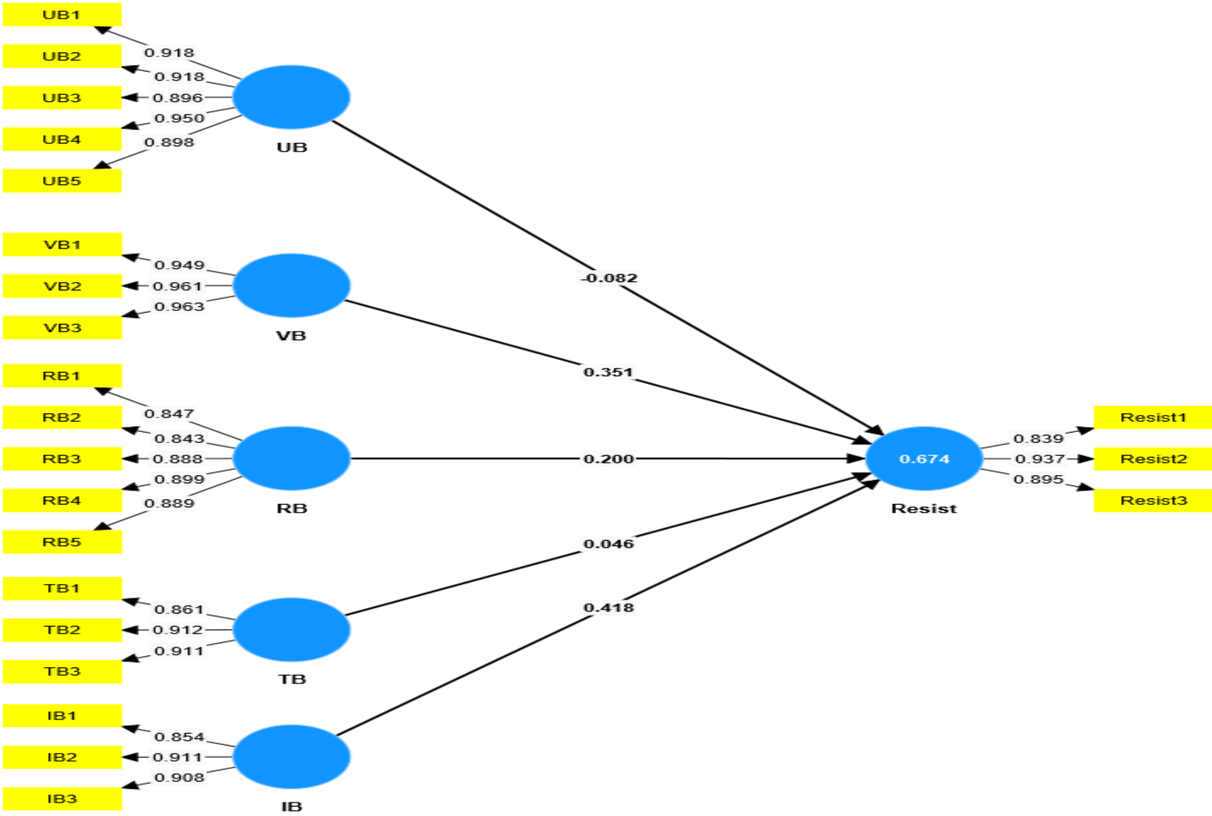

Figure 1. MGA path results

To further confirm the MGA results, we conducted a bootstrapping analysis for each group—farmers with university education and those without. This additional step provides more robust statistical insights by generating confidence intervals and determining the significance of the relationships between variables in each group. By examining the bootstrapping results, we aim to confirm the reliability of the group-specific findings, particularly in assessing the impact of various barriers on resistance to digital payment systems across different educational levels. The bootstrapping results for each group can be seen in table 8.

Table 8
Bootstrapping Result Across Different Groups

	With University Education				**Without University Education**			
	Original (UE)	**t value (UE)**	**p value (UE)**	**Significance**	**Original (Non UE)**	**t value (Non UE)**	**p value (Non UE)**	**Significance**
UB -> Resist	-0.082	0.826	0.409	No	0.070	0.813	0.416	No
VB -> Resist	0.351	3.036	0.002	Yes	0.223	2.299	0.022	Yes
RB -> Resist	0.200	2.145	0.032	Yes	-0.077	0.771	0.441	No
TB -> Resist	0.046	0.478	0.633	No	0.197	2.462	0.014	Yes
IB -> Resist	0.418	3.463	0.001	Yes	0.481	4.783	0.000	Yes

The bootstrapping results as shown in table 8 reveal confirm the MGA result by highlighting the significance statistical difference in the relationship between RB and resistance, while the differences were less pronounce in the other relationships. For the group with university education (UE), value barriers (VB), risk barriers (RB), and image barriers (IB) significantly contribute to resistance, with IB having the strongest effect with a path coefficient of 0.418. This suggests that educated farmers are more sensitive to the perceived risks and value propositions of digital payments, and they may be more conscious of how adopting such innovations could affect their social image. On the other hand, for farmers without university education, VB, IB and tradition barriers (TB) play a more prominent role in driving resistance, while RB is insignificant. This highlights that less-educated farmers are less concerned about risk but more influenced by traditional practices and value-related concerns, suggesting that educational background shapes how different barriers are perceived and acted upon. These findings underscore the importance of tailoring digital payment adoption strategies to specific educational profiles within the farming community.

Discussions

The findings of this study indicate that university education significantly moderates the relationship between risk barriers and resistance to digital payment systems. However, the value of the path difference is not as it was expected in the hypothesis. A positive path difference in the MGA result of the relationship between RB and Resistance indicates that the effect of RB on resistance is stronger among farmers with university education attainment. This result contrast with previous studies that underscored the importance role of the level of education on determining adoption behaviour of digital payment as indicated in studies by Akinyemi and Mushunje (2020) and Zhu *et al.* (2021).

A possible reason for this result could be that individuals with higher education are more risk-averse when it comes to adopting new technologies in complex settings like agricultural payments. Farmers with a university education may have greater awareness of potential risks, such as data privacy, system failures, or financial loss, and as a result, their resistance is heightened. On the contrary, less-educated farmers may not fully grasp these risks or may prioritize immediate utility and ease of use, making risk less of a factor in their resistance. A study by Setyaningrum *et al.* (2022) revealed that in general, Indonesian society, especially those living in rural regions have a medium or relatively low culture of Long-term orientation (LTO). With this low on LTO culture, the rural inhabitants must be more focus on the immediate benefit of using certain innovation, including digital payment.

Previous research has highlighted the critical role of perceived risk in digital payment resistance (Kaur *et al.*, 2020; Cham *et al.*, 2021; Ghosh, 2022), yet the moderating role of education has been less explored. This study diverges from findings that indicate education reduces resistance by increasing confidence and familiarity with technology. Instead, it reveals the complexity of education's influence, where higher education may sometimes amplify resistance due to greater risk awareness.

Furthermore, the other relationships between barriers (usage, value, tradition, image) and resistance in this study's model were not moderated by university education. This suggests that these barriers may be more universally perceived across educational levels, or that factors such as practical experience, local norms, or peer influences play a stronger role in shaping these perceptions rather than formal education. Sivathanu (2017) and Migliore *et al.* (2022) found that social influence had significant impact on digital payment adoption across different groups. In this study, the effect of usage, value, tradition, and image barriers on the resistance of digital payment were significant or not significant in both groups (farmers with and without university education attainment), indicating no significant difference in the respective level of education, underscoring the non-existence of moderating role of university education in the relationships.

These results offer important implications. For policymakers and digital payment providers targeting the agricultural sector, educational initiatives aimed at reducing perceived risks may need to be tailored more effectively for highly educated farmers. Providing detailed information on security measures and risk management strategies could mitigate concerns. Meanwhile, for less-educated farmers, simpler, user-friendly interfaces and focus on practical benefits may be key. The study suggests that a one-size-fits-all approach may not suffice, and a more segmented strategy based on educational background is crucial for successful digital payment adoption in the agricultural sector.

Conclusion/Implications for Research/Policy

In conclusion, this study investigated the role of various barriers—usage, value, risk, tradition, and image—in influencing farmers' resistance to digital payment systems, with a specific focus on the moderating effect of university education. The findings indicate that university education significantly moderates the impact of risk barriers, with educated farmers exhibiting stronger resistance due to perceived risks, which was contrary to initial expectations. Additionally, value, usage, tradition, and image barriers also play a significant role, though their effects were not significantly difference across the educational based groups of population.

The study's implications are twofold. First, it highlights the need for tailored interventions to address specific barriers faced by different educational groups. Policymakers and digital payment providers must consider educational backgrounds when designing strategies to encourage adoption among farmers. For instance, risk mitigation efforts should be emphasized for more educated farmers, while simplifying usage and enhancing perceived value might resonate more with less-educated farmers. Second, the findings suggest the importance of promoting digital literacy and fostering trust in digital payment systems across all educational levels to reduce resistance and facilitate wider adoption in the agricultural sector.

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