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Mobile Money Adoption and Entrepreneurs' Access to Trade Credit in the Informal Sector

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Abstract

Despite the contribution of previous studies to unravel the implications of mobile money in the developing world, the effect of this innovation on an important source of external finance, trade credit, has not been properly accounted for particularly in the informal sector. Using the 2016 FinAccess Household Survey, we investigate the relationship between mobile money adoption and the probability to receive goods and services on credit from suppliers based on a sample of entrepreneurs who operate informal businesses. We further explore the effect of mobile money adoption on the likelihood to offer goods and services on credit to customers. Our estimations suggest that entrepreneurs with mobile money are more likely to receive goods and services on credit from suppliers. We also find a positive and significant relationship between mobile money adoption and the likelihood to offer goods and services on credit to customers. The evidence supports the promotion of mobile money adoption among entrepreneurs in the informal sector to facilitate access to credit.

Keywords: Entrepreneurship; Financial Innovation, Mobile Money, Trade Credit

JEL Classification : D14, G21, L26, O16, O33

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1 Introduction

Financial constraints abound in developing countries where access to finance is a major obstacle to firm growth (Beck & Demirguc-kunt, 2006; Beck et al., 2005; Goedhuys & Sleuwaegen, 2000). At the same time, most people in the developing world do not have access to formal bank accounts (Demirgüç-Kunt et al., 2018; Demirgüç-Kunt, Klapper, Singer, & Van Oudheusden, 2015) and this further exacerbates the challenges faced by entrepreneurs in these countries. However, the advent of mobile money has revolutionised the payment landscape through the provision of financial services to both the banked and the unbanked segments of the society (Aker & Mbiti, 2010; Maurer, 2012; Suri, 2017).

Kenya is a typical example where mobile money has achieved tremendous success and about 96 per cent of households have at least a mobile money user (Suri & Jack, 2016). Mbiti and Weil (2016) document that before mobile money was introduced in Kenya, the most common means of receiving and sending money include friends, transportation companies, and post offices with friends accounting for about 50 per cent of such transactions. However, the launch of M-PESA (mobile money) in 2007 has brought about a significant change in financial transactions and by the year 2009 mobile money has become the leading payment instrument of choice in Kenya (Mbiti & Weil, 2016). The empirical evidence suggests that mobile money has contributed to reducing transaction costs that are associated with money transfers in Kenya (Jack & Suri, 2014).

Despite the contribution of previous studies to unravel the implications of mobile money in the developing world, the effect of this innovation on trade credit, has received limited attention. An exception is Beck et al (2018) who find a positive and significant relationship between mobile money and trade credit. However, the study by Beck et al (2018) is largely comprised of formal firms hence provides limited empirical evidence on the potential effect of mobile money adoption on the likelihood to receive trade credit in the informal sector. Also, the relationship between mobile money and entrepreneurs' propensity to offer trade credit in the informal sector is yet to be explored. We, therefore, ask the following question: does mobile money affect entrepreneurs' propensity to receive or offer trade credit in the informal sector?

The extant literature suggests that in a financially constrained environment, entrepreneurs particularly informal household entrepreneurs can mitigate financial constraints through trade credit (Biais & Gollier, 1997; Lin & Chou, 2015; Petersen & Rajan, 1997). Trade credit enables entrepreneurs to receive goods and services on credit from suppliers and potentially offer goods and services on credit to customers (Wilson & Summers, 2002). An important aspect of trade credit relationships is repayment. Although in a cash-based developing economy such as Kenya payment can be made via bus drivers, family, and friends, they are often associated with the risk of theft and appropriation (Beck et al., 2018; Jack & Suri, 2014). However, mobile money offers entrepreneurs a safe, affordable, and secure payment alternative with the potential to reduce default risk and strengthen trade credit relationships (Beck et al., 2018). Mobile money is expected to reduce delays in credit repayments

thereby enabling suppliers to offer goods and services on credit to entrepreneurs. Also, mobile money has the potential to improve the liquidity position of firms and consequently enable entrepreneurs to offer goods and services on credit to customers.

We investigate the relationship between mobile money adoption and two important entrepreneurial outcomes: the probability to receive goods and services on credit and the likelihood to offer goods and services on credit. This study relies on the 2016 FinAccess Household Survey of Kenya. We employ recursive bivariate probit as our main empirical model to account for possible endogeneity that may bias our results. In this case, first, we relate mobile money adoption to the likelihood to receive goods and services on credit. Second, we examine the relationship between mobile money adoption and the propensity to offer goods and services on credit.

We find that entrepreneurs with mobile money accounts are more likely to receive goods and services on credit from suppliers. Similarly, we find that mobile money account ownership significantly influences entrepreneurs' propensity to offer goods and services on credit to customers. We conduct additional robustness tests using propensity score matching approach. The results suggest that entrepreneurs who make or receive business-related payments via mobile money either occasionally or regularly are more likely to receive credit from suppliers or offer credit to customers. The findings support the promotion of mobile money adoption among entrepreneurs in the informal sector to facilitate access to credit.

This paper contributes to two strands of literature. First, it contributes to the growing body of literature on financial innovation in developing countries by providing additional evidence on the role of mobile money in facilitating entrepreneurs' access to external finance. Also, it reveals how mobile money relates to entrepreneurs' propensity to grant credit to customers. Second, this paper contributes to the trade credit literature. Unlike previous studies, we provide empirical evidence on the effect of mobile money on trade credit in the informal sector, a sector that is more likely to be financially constrained. Furthermore, we view entrepreneurs in the informal sector not only as recipients of trade credit but as credit givers.

The rest of the paper is organized as follows. Section 2 outlines the theoretical background of the study. Section 3 describes the data and main variables employed for analysis. Section 4 discusses the methodology. Section 5 presents the econometric results while Section 6 concludes with the main findings.

2 Theories and Evidence

2.1 Trade Credit

The question of why suppliers provide trade credit despite the existence of lending institutions such as banks is an essential puzzle trade credit theory seeks to unravel. An explanation for this puzzle is that suppliers have a comparative advantage over banks in acquiring information on the creditworthiness of clients and in the enforcement of repayment (Petersen & Rajan, 1997). Information on the creditworthiness of clients may be gathered by sales representatives through regular visits, and should the buyer default, the supplier can repossess the goods (Mian, Smith, & Jr, 1992). Also, the supplier can control payment by issuing threats to cut off future supplies if the actions of the buyer reduce the chances of repayment (Petersen & Rajan, 1997). Other explanations suggest that suppliers are incentivised to offer trade credit because it enables them to price discriminate (Brennan, Miksimovic, & Zechner, 1988).

On the demand and supply of trade credit, the empirical evidence suggests that entrepreneurs with limited access to bank loans depend more on trade credit whereas those with better financial access provide more trade credit (Biais & Gollier, 1997; Lin & Chou, 2015; Petersen & Rajan, 1997). In a recent study, Lin and Chou (2015) find a positive association between the supply of trade credit and access to bank loans. The relationship between the demand for trade credit and bank loans is, however, negative. This points to complementarity and substitution effects between trade credit and bank loans (Lin & Chou, 2015). Trade credit represents an important source of finance for financially constrained entrepreneurs given that it is not dependent on formal collateral but trust and reputation (Fafchamps, 1997).

Mcmillan and Woodruff (1999) note that trading relationships are crucial for entrepreneurs' access to trade credit and such relationships are equally important for repayment enforcement. Also, a supplier offers trade credit trusting that the customer will repay because of the incentive to maintain an ongoing relationship. The duration of business relationships enables reputation building with positive implications for trade credit access (Fafchamps, 1997; Mcmillan & Woodruff, 1999). Essentially, trade credit is granted with the understanding that payment will be made in full within a stipulated period (Wilson & Summers, 2002). However, trade credit relationships are often characterised by late payments. While late payments may not immediately lead to a discontinuity in trade credit, prolonged delay in payment is likely to attract such a sanction particularly in the case of microenterprises (Fafchamps, 1997). Also, partial repayment is likely to attract a temporal suspension of trade credit supply where there is an asymmetry of information between entrepreneurs (Troya-Martinez, 2017). The literature suggests that payment is a crucial aspect of trade credit relationships and disruption in payment can sever these relationships.

2.2 Mobile Money and Access to Trade Credit

Mobile money is a payment account that enables consumers to conduct basic financial transactions using their mobile phones without the need to hold a formal account with financial institutions. This innovation which is largely driven by mobile network operators has undergone significant improvement to accommodate a wide range of services such as deposits, withdrawals, savings, person-to-person payments, person-to-business payments, business-to-business payments, and government-to-person payments (Suri, 2017). Unlike bank branches that are located in a few neighbourhoods (Beck et al., 2009), mobile money agents are widespread and this makes mobile money services easily accessible to consumers (Mbiti & Weil, 2016).

As a payment instrument, mobile money can affect access to trade credit by facilitating repayment. Mobile money reduces the costs associated with financial transactions and enables transactions to occur between two individuals at distant locations (Jack et al., 2013; Jack & Suri, 2014). For example, Jack et al (2013) find that households with access to mobile money experience transactions up to 100 km more than households without mobile money access. Mobile money use is therefore expected to reduce delays in trade credit repayment. Consequently, suppliers may choose to offer trade credit to entrepreneurs with mobile money access given that there is the likelihood of timely payment irrespective of distance. Further mobile money can improve the liquidity position of firms through reduction in transaction costs thereby enabling entrepreneurs to provide goods and services on credit to customers.

Beck et al (2018) consider theft as market friction with the potential to disrupt settlement of transactions, inhibit credit repayment, and cause discontinuation in trade credit supply. Mobile money is viewed as a panacea for theft and the possible ways it relates to trade credit according to the authors are as follows. First, for a given level of productivity, trade credit has the potential to influence entrepreneurs' use of mobile money when purchasing inputs from suppliers. Second, theft during trade credit repayment, inter alia, may affect entrepreneurs' access to future credit. In this case, mobile money as a theft avoidance payment instrument has the potential to improve future credit market valuation for adopters and consequently increase the amount of trade credit available to an entrepreneur. This will, in turn, reinforce entrepreneurs' demand for mobile money. Third, subject to the risk of theft, users of cash are predisposed to a higher repayment burden compared to mobile money users and this can affect the quantity of goods one can buy on credit. Using firm-level data from Kenya, the authors provide empirical evidence that suggests that firm-level productivity and access to trade credit have a positive association with mobile money adoption.

Further, the empirical evidence suggests that the use of mobile money is associated with access to external finance (Jack et al., 2013; Jack & Suri, 2014; Munyegera & Matsumoto, 2016; Suri & Jack, 2016). In Kenya, for example, Jack et al (2013) find that mobile money has a significant effect on

households' access to credit and emergency-related transfers. Mobile money also engenders financial resilience and increases labour market outcomes especially for women who migrate from agriculture into business (Suri & Jack, 2016). Users of mobile money are also found to receive more remittances compared to non-users (Jack & Suri, 2014; Munyegera & Matsumoto, 2016). Additionally, Gosavi (2017) finds a positive association between mobile money use and firms' access to external finance. These findings are indicative of mobile money's ability to influence access to external finance. The evidence suggests that access to external finance is an additional mechanism through which mobile money affects entrepreneurs' decision to receive or offer trade credit. This view is consistent with the trade credit literature which indicates that entrepreneurs with access to finance provide more trade credit to customers (Biais & Gollier, 1997; Lin & Chou, 2015; Petersen & Rajan, 1997). This mechanism also applies to entrepreneurs' likelihood to receive credit given that access to external finance may improve the cash position of businesses and prevent default risks.

The literature on mobile money and trade credit opens a new research domain that requires further empirical evidence to guide policymakers and academics. Importantly, it will be interesting to examine the relationship between mobile money and trade credit in the informal sector which has received limited attention.

3 Data and Main Variables

The study employs the 2016 FinAccess Household Survey of Kenya to answer the research question. The 2016 FinAccess survey is part of a series of nationally representative household surveys that measure access to and use of financial services among the adult population in Kenya. This survey was spearheaded by the Financial Sector Deepening (FSD) of Kenya in collaboration with the Kenyan National Bureau of Statistics and the Central Bank. FSD has been instituted by the UK Department for International Development in 2005 to promote financial inclusion in Kenya (FSD Kenya, 2016a). For the 2016 survey, respondents were randomly selected at the household level and data collection took place between August 2015 and October 2015.

We focus on the 2016 survey because it provides essential information on the two dependent variables that are relevant to meet the research objective[2]. Thus, in addition to information on mobile money adoption, the survey provides information on how often entrepreneurial businesses receive goods and services on credit from suppliers and whether they grant credit to customers. For our analysis, we concentrate only on entrepreneurs who operate informal businesses. This is because microenterprises in the informal sector are most likely to face financial obstacles to growth. Moreover, these businesses are most likely to be excluded from the formal financial system. To gain insights into how mobile

[2] Information on the provision of goods and services on credit to customers is not available for the recent wave of the FinAcess survey. This paper focuses on the 2016 wave because this information is available and moreover it provides additional information on the frequency at which businesses receive goods and services on credit and how often they use mobile money to receive or make business-related payments

money adoption benefits businesses in the informal sector, we identify a sample of 2031 entrepreneurs who operate unregistered businesses for the analysis. We define entrepreneurs as respondents who reported self-employment or running own business as a source of income. The main variables of interest are discussed below while Table 1 and Table 2 present the definition of variables and summary statistics, respectively.

3.1 Dependent Variable

Conventionally, the supply of trade credit by entrepreneurial firms is measured using accounts receivable whereas demand for trade credit is proxied by accounts payable (Lin & Chou, 2015; Petersen & Rajan, 1997). While data on accounts receivable and accounts payable may be readily available for formal firms, this is unlikely to be the case for microenterprises, especially in developing countries. In developing countries, microenterprises are generally unregistered and are less likely to keep records of trade transactions with customers (Hermes, Kihanga, Lensink, & Lutz, 2015). Given the informal context of the study coupled with the absence of accounting records in the dataset, we rely on survey questions on the provision or access to goods and services on credit among respondents to measure trade credit.

The study uses two main dependent variables as proxies for trade credit. First, we measure how often entrepreneurs receive goods and services on credit from suppliers with an ordered variable where 0= never, 1 = rarely, 2 = occasionally, and 3 = regularly. Second, we measure whether entrepreneurs offer credit with an ordered variable where 0 = never, 1= a few customers, and 2 = most/all customers. Table 2 shows that about 63 percent of entrepreneurs never receive goods and services on credit from suppliers. However, 14 per cent, 15 per cent, and 8 per cent of entrepreneurs indicate that they receive goods and services on credit rarely, occasionally, and regularly respectively. About 16 per cent of entrepreneurs provide goods and services on credit to most or all customers while 54 per cent offer credit to a few customers and 30 per cent provide no credit.

3.2 Independent Variable and Controls

The main independent variable of interest is a binary variable that measures whether the entrepreneur is currently a registered mobile money user or otherwise. As indicated in Table 2, the adopters of mobile money constitute about 80 per cent of entrepreneurs. The high adoption rate observed attests to Kenya's position as the global leader in mobile money adoption. Further, the study controls for variables that are identified in the literature as determinants of trade credit. The study controls for entrepreneurs' access to informal loans (loan from family/friends) since the extant literature suggests that loans play a significant role in conditioning access to trade credit (Biais & Gollier, 1997). Our choice of informal loan as a control variable is guided by the fact that entrepreneurs in the informal sector are more likely to depend on informal sources of finance compared to bank capital (J. Wu, Si, & Wu, 2016). Nonetheless, we also control for bank account ownership among entrepreneurs. Bank accounts ownership is relevant because it is a major channel for accessing bank credit and it facilitates payments

as well. Furthermore, the study accounts for the availability of internal finance using entrepreneurs' monthly income. The availability of sufficient internal finance to an entrepreneur is expected to result in lower demand for trade credit (Hermes et al., 2015).

Importantly, the creditworthiness of entrepreneurial businesses is considered an important determinant of access to trade credit. We control for firm age as it is often considered as a proxy for the creditworthiness of firms (Petersen & Rajan, 1997). Firm age, for example, is an essential signal for business survival and reputation (Petersen & Rajan, 1997). In our case, firm age is measured by subtracting the year in which business started operating from 2015, the year in which the survey was carried out. Additionally, we control for the membership of informal associations. This includes informal societies such as savings and lending groups, investment clubs, and welfare groups to which the entrepreneur contributes regularly. Such groups, for example, can facilitate information sharing, access to loans, and act as an avenue to enforce trade credit repayment (Hermes et al., 2015; Mcmillan & Woodruff, 1999). Finally, other variables such as gender, age, location, education among others are accounted for in our estimations.

Table 1. Definition of variables

Variable	Description
Receive goods/services on credit	An ordered variable that measures how often business receives goods/services on credit from suppliers (0= never, 1=rarely, 2 = occasionally, 3 = regularly)
Offer goods/services on credit	An ordered variable that measures the extent to which businesses offer goods/services on credit to customers (0= never, 1=a few, 2 = most/all customers)
Mobile Money	1 = entrepreneur is currently a registered mobile money user, 0 otherwise
Urban	1 = Urban, 0 = Rural
Female	1 = Female, 0 = Male
ln_Age	Age of entrepreneur (log)
ln_income	monthly income of entrepreneur (log)
Secondary_plus	1 if the entrepreneur has at least secondary education, 0 otherwise
ln_business_age	business age (log)
ln_HH_size	The number of people in the household (in logs)
Bank account	1 if the entrepreneur currently has a bank account for everyday needs or current account, 0 otherwise
Informal loan	1 if the entrepreneur has access to loan from family/friends, 0 otherwise
Informal group	1 if entrepreneur belongs to at least 1 informal association, 0 otherwise
Proximity to agent (share)	Share of respondents in enumeration area who can access mobile money agent within 30 minutes (calculation is based on the full sample)

Table 2. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Receive goods/services on credit (ordered)					
Never	2,031	0.63	0.48	0	1
Rarely	2,031	0.14	0.35	0	1
Occasionally	2,031	0.15	0.36	0	1
Regularly	2,031	0.08	0.27	0	1
Offer goods/services on credit (ordered)					
Never	2,031	0.30	0.46	0	1
A few customers	2,031	0.54	0.50	0	1
Most/all customers	2,031	0.16	0.37	0	1
Mobile Money	2,031	0.80	0.40	0	1
Urban	2,031	0.51	0.50	0	1
Female	2,031	0.68	0.47	0	1
Age	2,031	35.84	13.02	16	93
Income	2,025	19177.18	38814.37	0	1000000
Secondary_plus	2,031	0.40	0.49	0	1
business_age	2,031	5.96	8.23	0	55
HH_size	2,031	4.45	2.38	1	16
Bank Account	2,031	0.26	0.44	0	1
Informal loan	2,031	0.25	0.43	0	1
Informal groups	2,031	0.59	0.49	0	1
Proximity to agent (share)	2,031	0.85	0.25	0	1

4 **Estimation Strategy**

Our main interest is to examine the effect of mobile money adoption on the likelihood to receive or offer goods and services on credit. A simple ordered probit model may have been helpful in testing for this relationship. However, the main independent variable, mobile money, is potentially endogenous. Thus, we anticipate that unobserved factors may affect both the probability to adopt mobile money and the likelihood to receive or offer goods and services on credit (see for example Jack & Suri, 2014). Moreover, there is potential simultaneity in the association between mobile money adoption and the outcomes of interest (Beck et al., 2018; Lorenz & Pommet, 2020). In this case, the use of a simple ordered probit model will lead to biased estimates. To correct for endogeneity, we follow the estimation approach of Greene (1998) and simultaneously estimate the decision to adopt mobile money and the probability to receive or offer goods and services on credit using a recursive bivariate probit model.

We employ the following specification:

$$Mobile\ money_{ijs} = \alpha_0 + \alpha_1 X1_{ijs} + z + \delta_j + \delta_s + \varepsilon_1 \quad (1)$$

$$Trade\ credit_{ijs} = \beta_0 + \beta_1 X2_{ijs} + \beta_2 Mobile\ money_{ijs} + \delta_j + \delta_s + \varepsilon_2 \quad (2)$$

$$\begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right) \quad (3)$$

where the error terms (ε_1 and ε_2) are assumed to be independently and identically distributed as bivariate normal with zero means, unit variances, and correlation coefficient ρ. In this specification $Mobile\ money_{ijs}$ corresponds to mobile money adopter i located in region j who operates an informal business in sector s; α_0 and β_0 are constants; $X1$ and $X2$ are vectors of controls; β_2 is the parameter of interest to be estimated; δ_j and δ_s are regional[3] and sector fixed-effect dummies, respectively. $Trade\ credit_{ijs}$ corresponds to the outcome variables of interest that capture how often entrepreneurs receive goods and services on credit on one hand and the extent to which they offer credit to customers. The econometric model employed for the analysis can be described as a semi-ordered bivariate probit where equation 1 and equation 2 are jointly estimated using a probit model and an ordered probit model, respectively.

To improve identification, we perform exclusion restriction using variable z, proximity to mobile money agent (measured at the level of enumeration area). The justification for this exclusion restriction variable is that access to mobile money agents is required for the effective use of mobile money services (Ky et al., 2018). We expect that those who live in localities with easy access to mobile money agents will be more likely to adopt mobile money for transactions. All estimations are carried out within Roodman (2011) mixed process estimation framework (CMP). The CMP provides a flexible framework for fitting simultaneous equation models where different models such as probit and ordered probit can be jointly estimated.

5 **Results**

5.1 Mobile Money Adoption and the Likelihood to Receive Goods and Services on Credit

This subsection examines the relationship between mobile money adoption and entrepreneurs' propensity to receive goods and services on credit from suppliers. Table 3 presents the semi-ordered bivariate probit estimates where the outcome of interest measures how often entrepreneurs receive goods and services on credit from suppliers. To ascertain the robustness of the estimations, we include either regional fixed-effect or sector fixed-effect dummies in our first sets of estimations before finally including both fixed-effects dummies in the last 2 columns. The model with both regional and sector fixed effects (columns 5 and 6) constitutes our preferred model. Therefore, the interpretation of results

[3] Regional dummies correspond to county dummies

is mainly based on this model. In line with our estimation strategy, we estimate the probability to adopt mobile money using a set of covariates identified in the literature to affect financial inclusion (Demirgüç-Kunt et al., 2018; Simpson & Buckland, 2009). These variables include proximity to mobile money agent (share), location in an urban area, the gender of the entrepreneur (Female), age of entrepreneur (in logs), income (in logs), education (secondary_plus), business age (in logs), and household size (in logs). As shown in Table 3, proximity to mobile money agent, the excluded variable, significantly predicts mobile money adoption at the 1 per cent significance level. This suggests that those who reside in localities with easy access to mobile money agents are more likely to adopt mobile money. Also, the results indicate that location in an urban area, income, education, and household size are significant determinants of mobile money adoption. There is, however, limited evidence in support of gender as a determinant.

We report the trade credit results alongside the mobile money adoption equation results in Table 3 (columns 2, 4, and 6). In this estimation, the recursive nature of our model allows for the main dependent variable in equation 1 (mobile money) to also appear as the independent variable of interest in equation 2. We control for bank account ownership, access to informal loans, and membership of an informal association in addition to the covariates employed in equation 1. The results show that mobile money adoption has a positive and significant association with the likelihood to receive goods and services on credit. The results are statistically significant at the 1 per cent significance level and robust to the inclusion of regional or sector fixed-effects dummies. In fact, the marginal effect estimates as indicated in Table A1 of Appendix A suggest that mobile money account ownership increases the likelihood to receive credit rarely, occasionally, and regularly by 11, 16.4, and 15.1 percentage points, respectively.

A possible explanation for this effect is that mobile money as a payment instrument can enable entrepreneurs to avoid delays in credit repayments. This is because, in the case of microenterprises especially in the informal sector, prolonged delays in credit repayment may lead to discontinuation in the supply of trade credit (Fafchamps, 1997). In this case, mobile money is expected to facilitate a timely payment for goods and services, and this may incentivise suppliers to provide more credit to entrepreneurs. Further, mobile money can reduce the risk of theft that is associated with alternative payment channels such as bus drivers (Beck et al., 2018). At the same time, those with mobile money can conduct financial transactions at reduced costs (Jack & Suri, 2014) leading to an improvement in the liquidity position of entrepreneurs. In this way, mobile money can prevent default risks which have the potential to disrupt entrepreneurs' access to trade credit from suppliers.

The control variables also show interesting results. As expected, business age has a positive and significant effect on the propensity to receive goods and services on credit. This indicates that the business age is relevant for trade credit access primarily because it provides an important signal for business survival and reputation (Petersen & Rajan, 1997). Bank account ownership and the variable Female also show a significant and positive association with the likelihood to receive goods and services

on credit although the result is not robust for the Female variable. The coefficients for entrepreneurs' age, education level, and to some extent location in an urban area are significant but negative suggesting that these categories of entrepreneurs are less likely to receive credit from suppliers in an informal setting. We find no significant association between informal loans and access to supplier credit. Also, the coefficients associated with monthly income and membership of an informal group are not statistically significant.

For our estimations, we observe that the correlation between the two error terms (rho) is significant, and this signifies the importance of unobserved factors in determining both the decision to adopt mobile money and the choice to receive goods and services on credit. The negative sign associated with rho, however, shows a negative correlation between the error terms. As earlier explained, this suggests that the use of a simple ordered probit model may provide biased estimates.

5.2 Mobile Money Adoption and the Likelihood to Offer Goods and Services on Credit

This subsection investigates the relationship between mobile money adoption and entrepreneurs' propensity to offer goods and services on credit to customers. We follow the same estimation strategy as in subsection 5.1. Table 4 presents the first stage and second stage results of the semi-ordered bivariate probit model. Columns (1), (3), and (5) present the estimates for the mobile money equation (equation 1) whereas columns (2), (4), and (6) provide the results for the trade credit equation (equation 2). Our main interest is the trade credit equation where the outcome variable captures the provision of goods and services on credit to customers. In line with our estimation strategy, we first provide the results where we include only regional fixed effect (columns 1 and 2). In columns (3) and (4) we introduce the sector fixed effect only and in the last two columns we include both regional and sector fixed effects to test for the robustness of the results.

As shown in Table 4, the coefficients on the mobile money variable in columns (2) and (4) are positive and statistically significant at the 1 per cent and 5 per cent significance levels respectively. The results remain significant and positive even after controlling for both regional and sector fixed effects in column (6). The evidence suggests that entrepreneurs who adopt mobile money are more likely to offer goods and services on credit to customers. The marginal effect estimates are reported in Table A2 of Appendix A. The marginal effects results show that mobile money adoption increases the probability to offer credit to either a few customers or most/all customers by 12.6 percentage points. As earlier explained mobile money can lead to liquidity improvement at the business level due to its potential to reduce the risk of theft and transaction costs. Improved liquidity will place entrepreneurs in a better financial position to provide goods and services on credit to customers. This explanation is in line with the trade credit literature which suggests that financial strength is a significant determinant of trade credit supply (Biais & Gollier, 1997; Lin & Chou, 2015; Petersen & Rajan, 1997). Also, mobile money can facilitate access to loans thereby enabling entrepreneurs to offer trade credit.

Table 3. Relationship between mobile money adoption and the likelihood to receive goods and services on credit

	Model with regional fixed effect only		Model with sector fixed effect only		Model with both regional and sector fixed effects	
	mobile money adoption	receive goods/services on credit	mobile money adoption	receive goods/services on credit	mobile money adoption	receive goods/services on credit
	(1)	(2)	(3)	(4)	(5)	(6)
Mobile Money		1.503***		1.061***		1.465***
		(0.101)		(0.236)		(0.111)
Proximity to agent (share)	0.517***		0.874***		0.537***	
	(0.149)		(0.168)		(0.155)	
Urban	0.230***	-0.109*	0.052	-0.067	0.220**	-0.097
	(0.086)	(0.064)	(0.089)	(0.060)	(0.086)	(0.064)
Female	-0.163**	0.120*	-0.047	-0.013	-0.128	0.041
	(0.081)	(0.061)	(0.083)	(0.065)	(0.086)	(0.063)
ln_Age	0.135	-0.238**	0.171	-0.284***	0.122	-0.269***
	(0.121)	(0.093)	(0.114)	(0.091)	(0.121)	(0.094)
ln_income	0.147***	-0.030	0.163***	-0.001	0.139***	-0.023
	(0.023)	(0.020)	(0.025)	(0.025)	(0.024)	(0.020)
Secondary_plus	0.656***	-0.240***	0.741***	-0.204**	0.669***	-0.229***
	(0.082)	(0.064)	(0.084)	(0.080)	(0.083)	(0.065)
ln_business_age	0.002	0.079**	0.013	0.095***	0.016	0.081**
	(0.040)	(0.032)	(0.039)	(0.032)	(0.041)	(0.032)
ln_HHsize	0.142*	0.041	-0.051	0.084	0.142*	0.030
	(0.086)	(0.065)	(0.083)	(0.063)	(0.086)	(0.065)
Bank account		0.223***		0.234***		0.237***
		(0.057)		(0.062)		(0.058)
Informal loan		0.053		0.016		0.040
		(0.058)		(0.064)		(0.059)

Informal groups		0.053		0.064		0.063
		(0.051)		(0.058)		(0.052)
Constant	-1.377***		-2.261***		-1.483***	
	(0.530)		(0.523)		(0.550)	
cut2 1		0.820**		0.220		0.544
		(0.412)		(0.396)		(0.426)
cut2 2		1.190***		0.629		0.927**
		(0.413)		(0.398)		(0.426)
cut2 3		1.774***		1.289***		1.537***
		(0.420)		(0.405)		(0.430)
Regional dummies	YES	YES	NO	NO	YES	YES
Sector dummies	NO	NO	YES	YES	YES	YES
Clustered Std. Err	YES	YES	YES	YES	YES	YES
Rho_12		-0.856***		-0.561***		-0.828***
		(0.061)		(0.152)		(0.068)
Wald χ^2		1417.95		504.37		1515.93
Probability > χ^2		0.000		0.000		0.000
No. of observations		2025		2025		2025

Notes: The table reports the coefficient estimates of the relationship between mobile money adoption and the likelihood to receive goods and services on credit from suppliers. Robust standard errors in parentheses are clustered at the sublocation level (sub-location is a basic administrative unit in the dataset). All estimations are carried out using Roodman (2011) cmp Stata package.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. Relationship between mobile money adoption and the likelihood to offer goods and services on credit

	Model with regional fixed effect only		Model with sector fixed effect only		Model with both regional and sector fixed effects	
	mobile money adoption	offer goods/services on credit	mobile money adoption	Offer goods/services on credit	mobile money adoption	Offer goods/services on credit
	(1)	(2)	(3)	(4)	(5)	(6)
Mobile Money		0.828***		0.494**		0.680**
		-0.289		-0.208		-0.302
Proximity to agent (share)	0.545***		0.871***		0.536***	
	(0.185)		(0.174)		(0.188)	
Urban	0.213**	-0.027	0.046	-0.030	0.199**	-0.027
	(0.095)	(0.061)	(0.091)	(0.060)	(0.095)	(0.062)
Female	-0.198**	0.181***	-0.061	0.083	-0.159*	0.117*
	(0.086)	(0.060)	(0.084)	(0.061)	(0.089)	(0.061)
ln_Age	0.100	-0.067	0.159	-0.072	0.091	-0.081
	(0.123)	(0.089)	(0.114)	(0.088)	(0.123)	(0.090)
ln_income	0.149***	0.032	0.168***	0.041*	0.143***	0.043*
	(0.024)	(0.025)	(0.025)	(0.023)	(0.025)	(0.025)
Secondary_plus	0.662***	-0.157**	0.740***	-0.145**	0.675***	-0.145*
	(0.085)	(0.074)	(0.084)	(0.068)	(0.085)	(0.075)
ln_business_age	-0.007	-0.01	0.016	0.016	0.007	-0.003
	(0.042)	(0.029)	(0.039)	(0.029)	(0.043)	(0.029)
ln_HHsize	0.158*	-0.023	-0.043	0.003	0.161*	-0.025
	(0.086)	(0.061)	(0.084)	(0.059)	(0.087)	(0.061)
Bank account		0.187***		0.136**		0.198***
		(0.061)		(0.062)		(0.063)
Informal loan		0.053		-0.001		0.044
		(0.059)		(0.060)		(0.060)
Informal groups		0.042		0.083		0.038
		(0.054)		(0.052)		(0.054)
Constant	-1.279**		-2.258***		-1.357**	-0.054

	(0.558)		(0.536)		(0.585)	
cut_2 1		0.345		0.148		0.289
		(0.398)		(0.393)		(0.414)
cut_2 2		1.895***		1.669***		1.874***
		(0.398)		(0.398)		(0.414)
Regional dummies	YES	YES	NO	NO	YES	YES
Sector dummies	NO	NO	YES	YES	YES	YES
Clustered Std. Err	YES	YES	YES	YES	YES	YES
Rho_12		-0.409**		-0.254**		- 0.325**
		(0.166)		(0.118)		(0.173)
Wald χ^2		755.82		333.09		776.79
Probability > χ^2		0.000		0.000		0.000
No. of observations		2025		2025		2025

Notes: The table reports the coefficient estimates of the relationship between mobile money adoption and the likelihood to offer goods and services on credit to customers. Robust standard errors in parentheses are clustered at the sublocation level (sub-location is a basic administrative unit in the dataset). All estimations are carried out using Roodman (2011) cmp Stata package. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The control variables show some interesting results. The coefficient on the variable Female is positive and statistically significant at the 1 per cent significance level when we include regional dummies without sector dummies. However, the significance level reduces when both regional and sector fixed effects are controlled for. Overall, the results in column (6) suggest that female entrepreneurs are more likely to offer goods and services on credit to their customers compared to their male entrepreneurs. Female entrepreneurs are possibly more likely to supply trade credit because they are better able to monitor the creditworthiness of customers compared to male entrepreneurs (Hermes et al., 2015). Also, income, education, and bank account ownership are significant determinants of the probability to offer goods and services on credit albeit education has a negative effect.

5.3 Robustness Checks

To test for the robustness of the results, we implement a propensity score matching technique using two treatment arms that reflect the payment functions of mobile money. First, we consider an entrepreneur as treated if the entrepreneur's business makes payment via mobile money regularly or occasionally. Second, we consider an entrepreneur as treated if the entrepreneur's business regularly or occasionally receives payments via mobile money. We use two binary outcomes that reflect the frequency or the extent to which entrepreneurs receive or offer goods and services on credit. The first outcome of interest is a binary variable equals 1 if the entrepreneur receives goods and services on credit regularly or occasionally from suppliers. The second outcome variable equals 1 if the entrepreneur offers goods and services to all or most customers on credit, 0 otherwise.

A potential objective will be to estimate the differences in outcome for the same entrepreneur with or without mobile money usage. However, in practice, we cannot simultaneously observe both outcomes for the same individual (Caliendo & Kopeinig, 2008). Consequently, we use a propensity score matching approach to create a counterfactual group that is similar in many ways to the treated group based on observable characteristics (Rosenbaum & Rubin, 1983). In this way, we can attribute the differences in outcome observed between the control group and the treated group to mobile money usage.

We use a probit model to estimate the propensity score which is defined as the probability of assignment to treatment conditional on a vector of covariates. Table A3 and Table A4 of Appendix A present the probit estimates for the propensity score using a set of variables that are theoretically assumed to be related to both treatment and outcome but not affected by treatment. The covariates include location in an urban area, gender (Female), age of respondent (in logs), education (secondary_plus), membership of an informal group, business age, and household size. We estimate the Average Treatment Effect on the Treated (ATT) based on the assumption of conditional independence and common support. Guided by the trade-off between bias, variance, and matching quality, we use three different matching algorithms to estimate the effect of mobile money usage on the outcome variables of interest. With the

common support condition imposed, we conduct Kernel Matching with bandwidth 0.02, Radius Matching with caliper 0.01, and Nearest Neighbour Matching for 5 neighbours. Also, the matching quality for all estimations is examined to ensure that there is no significant difference between the treated and the control groups after matching as indicated in Table A5, A6, and A7 of Appendix A.

Table 5 presents the estimates for the Average Treatment Effect on the Treated (ATT). We interpret the results using Kernel matching but present the estimates for the other algorithms for comparison. In respect of the first treatment arm, we observe a significant and positive treatment effect on the treated of 0.119 and 0.060 for the outcomes Receive Credit and Offer Credit, respectively. The results show that entrepreneurs who regularly or occasionally make payments via mobile money are more likely to receive or offer goods and services on credit. The estimated results also show a positive and significant relationship between the use of mobile money to receive payments and the probability to offer or receive goods and services on credit. The evidence suggests that entrepreneurs who regularly or occasionally receive payments via mobile money are more likely to receive goods and services on credit regularly or occasionally from suppliers. Further, the results imply that the regular or occasional use of mobile money to receive payments is associated with the probability to offer credit to most if not all customers.

Also, we investigate whether the effect of mobile money usage on the propensity to receive or offer credit is likely to change in the face of deviation from the unconfoundedness assumption (Becker & Caliendo, 2007). We employ mhbounds proposed by Becker and Caliendo (2007) to examine the sensitivity of the matching estimates to hidden bias. The interest here is to investigate the critical levels of gamma (Γ) at which the estimates will be considered as biased[4]. The evidence as presented in Table 5 indicates that the propensity score matching estimates will only become sensitive to hidden bias at critical levels of Γ = 1.30 -1.65. This suggests that the estimates are relatively robust to hidden bias. Overall, the findings confirm our earlier estimates that mobile money adoption and specifically the use of mobile money for business related payments positively influences entrepreneurs' probability to receive or offer trade credit.

6 Conclusion

This paper investigates the relationship between mobile money adoption and entrepreneurs' propensity to receive goods and services on credit on one hand and their likelihood to offer credit to customers on the other. We focus mainly on the informal sector given that entrepreneurs in this sector are more exposed to financial constraints. Our main results suggest that entrepreneurs who adopt or use mobile money for business-related payments are more likely to receive goods and services on credit from

[4] Gamma (Γ) is the level at which the results will become sensitive to hidden bias and is estimated using mhbounds. mhbound is a Stata command that tests the sensitivity of matching results to hidden bias for binary outcome variables.

suppliers. Similarly, the results reveal that mobile money adopters are more likely to grant goods and services on credit to customers compared to nonadopters.

The findings of the study have important policy implications. We demonstrate that mobile money adoption is relevant for engendering access to external finance in the informal sector. Our contribution to the literature in this regard is interesting given that the informal sector is pervasive in developing countries and entrepreneurs who operate in this sector face multiple challenges including financial exclusion. The evidence, therefore, supports the promotion of financial inclusion via mobile money in the informal sector to facilitate access to external finance. Also, our findings indicate that mobile money adoption influences the provision of trade credit to customers. This suggests that mobile money has the potential to indirectly improve the welfare of non-business customers through the provision of goods and services on credit. The promotion of financial inclusion through mobile money should therefore be encouraged to bring about economic development.

It is also important that policies go beyond the promotion of mobile money account ownership and ensure that factors that may inhibit the actual use of mobile money for transactions are mitigated. It is worth noting that the findings as discussed do not constitute causality. The data employed for the study is cross-section data and so we are unable to fully establish the causal linkage between mobile money and trade credit. Nonetheless, the study contributes to the literature on financial inclusion and entrepreneurship. Future studies may explore the causal linkage between mobile money adoption and access to trade credit. Finally, it will be interesting to examine how mobile money differently affects the provision of goods on one hand and services on the other.

Table 5. Propensity Score Matching (PSM) estimates of the Average Treatment Effect on the Treated (ATT)

	Kernel	Radius	Nearest neighbour	Observations		Critical level of hidden bias Gamma (Γ)
Outcome	ATT	ATT	ATT	Treated	Controls	
	Treatment equals 1 if the business makes regular/occasional payment via mobile money					
Receive credit regularly/occasionally	0.119***	0.119***	0.102***	400	1,631	1.50 - 1.65
	(4.49)	(4.48)	(3.58)			
Offer credit to most/ all customers	0.060***	0.059**	0.083***	400	1,631	1.30 - 1.40
	(2.63)	(2.55)	(3.40)			
	Treatment equals 1 if the business receives regular/occasional payment via mobile money					
Receive credit regularly/occasionally	0.095***	0.092***	0.101***	401	1,630	1.45
	(3.64)	(3.48)	(3.65)			
Offer credit to most/ all customers	0.085***	0.083***	0.091***	401	1,630	1.45
	(3.65)	(3.56)	(3.68)			

Notes: t-values are in parentheses. Receive Credit equals 1 for those who receive credit regularly or occasionally. Offer Credit is a binary variable which equals 1 for entrepreneurs who offer goods and services on credit to most or all customers. Gamma (Γ) is the level at which the results will become sensitive to hidden bias and is estimated using mhbounds. Kernel Matching with bandwidth 0.02, Radius Matching with caliper 0.01, and Nearest Neighbour Matching for 5 neighbours. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Appendix A

Table A 1. Marginal effect estimates of the relationship between mobile money adoption and the likelihood to receive goods and services on credit

	Receive credit (never)	Receive credit (rarely)	Receive credit (occasionally)	Receive credit (regularly)
Mobile money	-0.425***	0.110***	0.164***	0.151***
	(0.023)	(0.007)	(0.009)	(0.021)
Urban	0.037	-0.006	-0.014	-0.017
	(0.024)	(0.004)	(0.009)	(0.011)
Female	-0.015	0.003	0.006	0.007
	(0.024)	(0.004)	(0.009)	(0.011)
ln_Age	0.102***	-0.018***	-0.038***	-0.046***
	(0.036)	(0.007)	(0.014)	(0.016)
ln_income	0.009	-0.002	-0.003	-0.004
	(0.008)	(0.001)	(0.003)	(0.004)
Secondary_plus	0.086***	-0.016***	-0.033***	-0.038***
	(0.024)	(0.004)	(0.009)	(0.012)
ln_business_age	-0.031**	0.005**	0.012**	0.014**
	(0.012)	(0.002)	(0.005)	(0.005)
ln_HHsize	-0.011	0.002	0.004	0.005
	(0.025)	(0.004)	(0.009)	(0.011)
Bank account	-0.091***	0.014***	0.033***	0.044***
	(0.022)	(0.004)	(0.009)	(0.011)
Informal loan	-0.015	0.003	0.006	0.007
	(0.023)	(0.004)	(0.008)	(0.010)
Informal groups	-0.024	0.004	0.009	0.011
	(0.020)	(0.004)	(0.008)	(0.009)
No. of observations	2,025	2,025	2,025	2,025

Notes: The marginal effect is computed at the means of all explanatory variables. Equations for mobile money adoption and access to goods and services on credit are jointly estimated using a semi-ordered bivariate probit model. Results for the trade credit equation are reported. Robust standard errors in parentheses are clustered at the sublocation level (sub-location is the basic administrative unit in the dataset) and the model includes both regional and sector fixed-effect dummies. All estimations are carried out using Roodman (2011) cmp Stata package.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A 2. Marginal effect estimates of the relationship between mobile money adoption and the likelihood to offer goods and services on credit

	Offer credit (never)	Offer credit (to a few customers)	Offer credit (to most/all customers)
Mobile money	-0.252**	0.126*	0.126***
	(0.116)	(0.070)	(0.047)
Urban	0.009	-0.003	-0.006
	(0.021)	(0.007)	(0.014)
Female	-0.041*	0.014*	0.026*
	(0.022)	(0.008)	(0.014)
ln_Age	0.028	-0.009	-0.019
	(0.031)	(0.010)	(0.021)
ln_income	-0.015*	0.005*	0.010*
	(0.008)	(0.003)	(0.006)
Secondary_plus	0.050*	-0.017*	-0.033*
	(0.027)	(0.009)	(0.017)
ln_business_age	0.001	-0.000	-0.001
	(0.010)	(0.003)	(0.007)
ln_HHsize	0.009	-0.003	-0.006
	(0.021)	(0.007)	(0.014)
Bank account	-0.066***	0.018***	0.048***
	(0.020)	(0.005)	(0.016)
Informal loan	-0.015	0.005	0.010
	(0.021)	(0.006)	(0.014)
Informal groups	-0.013	0.004	0.009
	(0.019)	(0.006)	(0.012)
No. of observations	2,025	2,025	2,025

Notes: The marginal effect is computed at the means of all explanatory variables. Equations for mobile money adoption and the probability to offer goods and services on credit are jointly estimated using a semi-ordered bivariate probit model. Results for the trade credit equation are reported. Robust standard errors in parentheses are clustered at the sublocation level (sub-location is the basic administrative unit in the dataset) and the model includes both regional and sector fixed-effect dummies. All estimations are carried out using Roodman (2011) cmp Stata package.

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

Table A 3. Probit estimates of propensity score where treatment equals 1 if the business makes regular/occasional payment via mobile money

	Coef.	Std. Err.	z	P>z
Urban	0.241	0.068	3.530	0.000
Female	-0.424	0.071	-5.970	0.000
ln_Age	-0.009	0.116	-0.080	0.937
Secondary_plus	0.376	0.069	5.420	0.000
Informal group	0.147	0.069	2.140	0.032
Business age	0.000	0.005	-0.010	0.995
ln_HHsize	0.052	0.073	0.720	0.472
Constant	-1.019	0.440	-2.320	0.020
Observation	2031			

Table A 4. Probit estimates of propensity score where treatment equals 1 if the business receives payment via mobile money regularly/occasionally

	Coef.	Std. Err.	z	P>z
Urban	0.286	0.069	4.160	0.000
Female	-0.412	0.071	-5.800	0.000
ln_Age	-0.041	0.116	-0.350	0.725
Secondary_plus	0.362	0.069	5.220	0.000
Informal groups	0.190	0.069	2.760	0.006
Business age	-0.001	0.005	-0.180	0.858
ln_HHsize	-0.058	0.072	-0.800	0.422
Constant	-0.781	0.440	-1.770	0.076
Observation	2031			

Table A 5. Covariance balance test for kernel matching comparing differences between the control group and the treated group before and after matching

	Treatment equals 1 if the business makes payment via mobile money regularly/occasionally							Treatment equals 1 if the business receives payment via mobile money regularly/occasionally					
	Unmatched	Mean		%reduct		t-test		Mean		%reduct		t-test	
Variable	Matched	Treated	Control	%bias	bias	t	p>t	Treated	Control	%bias	bias	t	p>t
Urban	U	0.618	0.489	26.1		4.64	0.000	0.641	0.483	32.2		5.72	0.000
	M	0.617	0.606	2.1	91.9	0.3	0.762	0.641	0.634	1.5	95.4	0.21	0.832
Female	U	0.545	0.710	-34.6		-6.39	0.000	0.546	0.710	-34.3		-6.34	0.000
	M	0.546	0.550	-0.8	97.6	-0.11	0.911	0.546	0.547	-0.1	99.8	-0.01	0.992
ln_Age	U	3.538	3.553	-4.8		-0.83	0.407	3.533	3.555	-7.1		-1.21	0.226
	M	3.539	3.543	-1.2	75.3	-0.17	0.863	3.533	3.532	0.3	95.2	0.05	0.961
Secondary_plus	U	0.555	0.362	39.5		7.16	0.000	0.561	0.360	41.1		7.46	0.000
	M	0.554	0.553	0.2	99.5	0.03	0.976	0.561	0.563	-0.5	98.8	-0.07	0.947
Informal group	U	0.613	0.584	5.9		1.05	0.294	0.623	0.581	8.7		1.55	0.122
	M	0.612	0.630	-3.8	34.7	-0.55	0.584	0.623	0.617	1.3	85.2	0.18	0.854
Business age	U	5.708	6.028	-4.1		-0.70	0.486	5.586	6.058	-6.2		-1.03	0.304
	M	5.709	5.710	0	99.7	-0.00	0.999	5.586	5.465	1.6	74.3	0.24	0.812
ln_HHsize	U	1.547	1.604	-11.9		-2.19	0.029	1.5126	1.6128	-20.7		-3.86	0.000
	M	1.545	1.545	0	99.8	-0.00	0.997	1.5126	1.506	1.4	93.4	0.19	0.850

Note: U = Unmatched, M = Matched

Table A 6. Covariance balance test for nearest neighbour matching comparing differences between the control group and the treated group before and after matching.

		Treatment equals 1 if the business makes payment via mobile money regularly/occasionally						Treatment equals 1 if the business receives payment via mobile money regularly/occasionally					
	Unmatched	Mean		%reduct		t-test		Mean		%reduct		t-test	
Variable	Matched	Treated	Control	%bias	bias	t	p>t	Treated	Control	%bias	bias	t	p>t
Urban	U	0.618	0.489	26.1		4.64	0.000	0.641	0.483	32.2		5.72	0.000
	M	0.617	0.615	0.4	98.4	0.06	0.954	0.641	0.611	6.1	81.1	0.88	0.382
female	U	0.545	0.710	-34.6		-6.39	0.000	0.546	0.710	-34.3		-6.34	0.000
	M	0.546	0.530	3.5	90	0.47	0.640	0.546	0.527	4	88.4	0.54	0.591
ln_Age	U	3.538	3.553	-4.8		-0.83	0.407	3.533	3.555	-7.1		-1.21	0.226
	M	3.539	3.536	0.9	81.3	0.13	0.894	3.533	3.543	-3.4	52.3	-0.49	0.627
Secondary_plus	U	0.555	0.362	39.5		7.16	0.000	0.561	0.360	41.1		7.46	0.000
	M	0.554	0.542	2.4	94	0.33	0.744	0.561	0.567	-1.2	97	-0.17	0.865
Informal groups	U	0.613	0.584	5.9		1.05	0.294	0.623	0.581	8.7		1.55	0.122
	M	0.612	0.602	1.9	66.9	0.28	0.783	0.623	0.610	2.6	69.5	0.38	0.706
Business age	U	5.708	6.028	-4.1		-0.70	0.486	5.586	6.058	-6.2		-1.03	0.304
	M	5.709	5.630	1	75.1	0.15	0.880	5.586	5.828	-3.2	48.6	-0.46	0.644
ln_HHsize	U	1.547	1.604	-11.9		-2.19	0.029	1.513	1.613	-20.7		-3.86	0.000
	M	1.545	1.528	3.5	70.7	0.48	0.633	1.513	1.482	6.3	69.4	0.87	0.387

Note: U = Unmatched, M = Matched

Table A 7. Covariance balance test for radius matching comparing differences between the control group and the treated group before and after matching.

		Treatment equals 1 if the business makes payment via mobile money regularly/occasionally						Treatment equals 1 if the business receives payment via mobile money regularly/occasionally					
	Unmatched	Mean		%reduct		t-test		Mean		%reduct		t-test	
Variable	Matched	Treated	Control	%bias	bias	t	p>t	Treated	Control	%bias	bias	t	p>t
Urban	U	0.618	0.489	26.1		4.64	0.000	0.641	0.483	32.2		5.72	0.000
	M	0.617	0.605	2.4	91	0.34	0.737	0.641	0.625	3.3	89.6	0.48	0.631
Female	U	0.545	0.710	-34.6		-6.39	0.000	0.546	0.710	-34.3		-6.34	0.000
	M	0.546	0.545	0.4	98.9	0.05	0.961	0.546	0.540	1.3	96.2	0.18	0.858
ln_Age	U	3.538	3.553	-4.8		-0.83	0.407	3.533	3.555	-7.1		-1.21	0.226
	M	3.539	3.541	-0.8	83.2	-0.12	0.906	3.533	3.530	0.9	87.8	0.12	0.901
Secondary_plus	U	0.555	0.362	39.5		7.16	0.000	0.561	0.360	41.1		7.46	0.000
	M	0.554	0.549	1	97.4	0.14	0.888	0.561	0.567	-1.2	97.2	-0.16	0.873
Informal groups	U	0.613	0.584	5.9		1.05	0.294	0.623	0.581	8.7		1.55	0.122
	M	0.612	0.627	-3.1	47.9	-0.44	0.663	0.623	0.615	1.8	79.2	0.26	0.797
Business age	U	5.708	6.028	-4.1		-0.70	0.486	5.586	6.058	-6.2		-1.03	0.304
	M	5.709	5.759	-0.6	84.4	-0.09	0.925	5.586	5.392	2.6	58.9	0.38	0.701
ln_HHsize	U	1.547	1.604	-11.9		-2.19	0.029	1.513	1.613	-20.7		-3.86	0.000
	M	1.545	1.556	-2.5	79.4	-0.34	0.730	1.513	1.501	2.5	87.9	0.35	0.730

Note: U = Unmatched, M = Matched

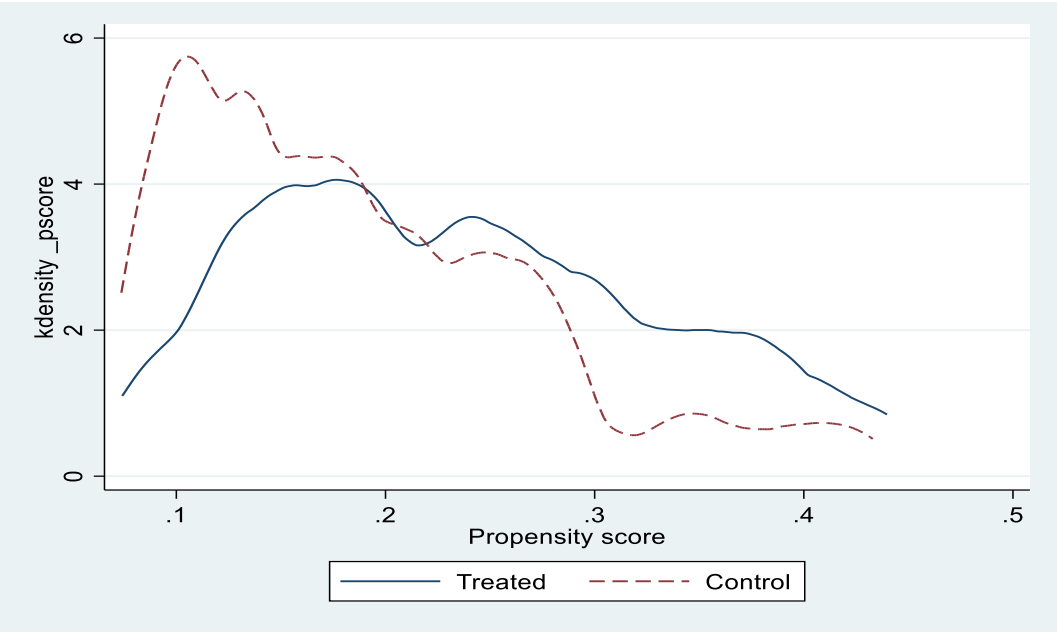

Figure A 1. Kernel density graph showing the overlap in the distribution of propensity score (treatment variable is 1 if the business makes payment via mobile money regularly/occasionally).

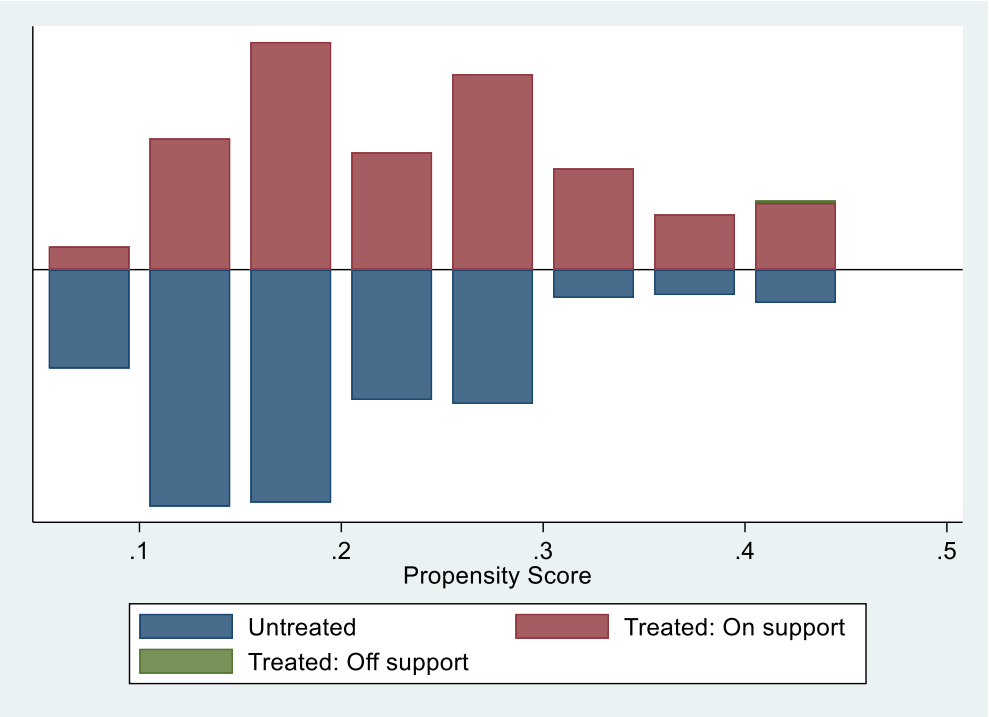

Figure A 2. Graph showing common support in the distribution of propensity score (treatment variable is 1 if the business makes payment via mobile money regularly/occasionally).

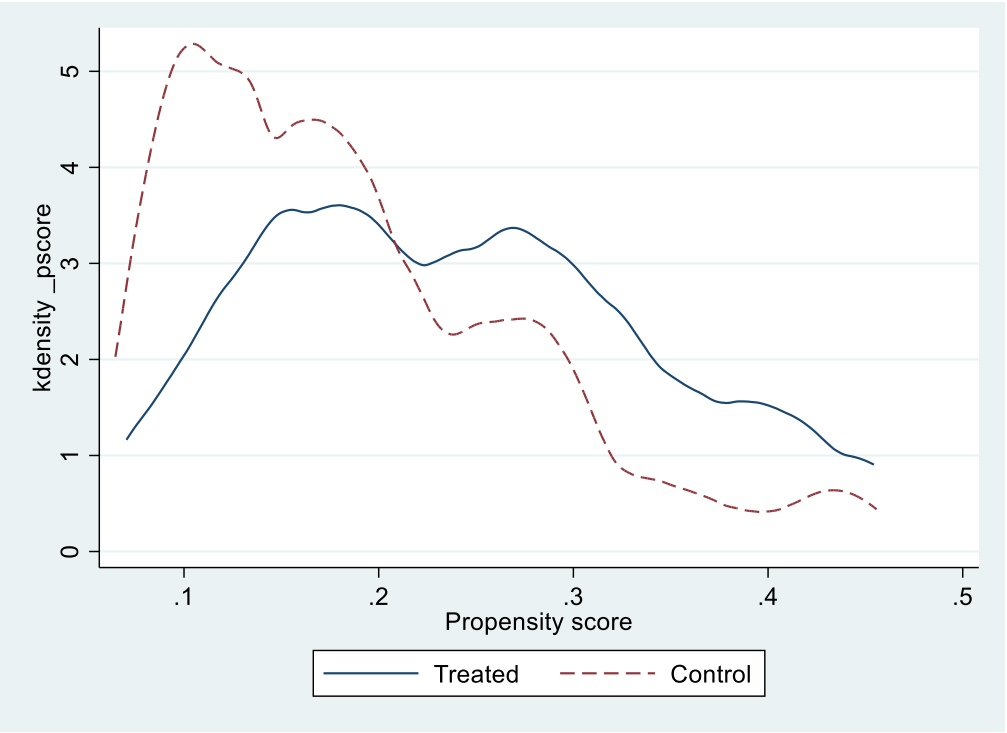

Figure A 3. Kernel density graph showing the overlap in the distribution of propensity score (treatment variable is 1 if the business receives payment via mobile money regularly/occasionally).

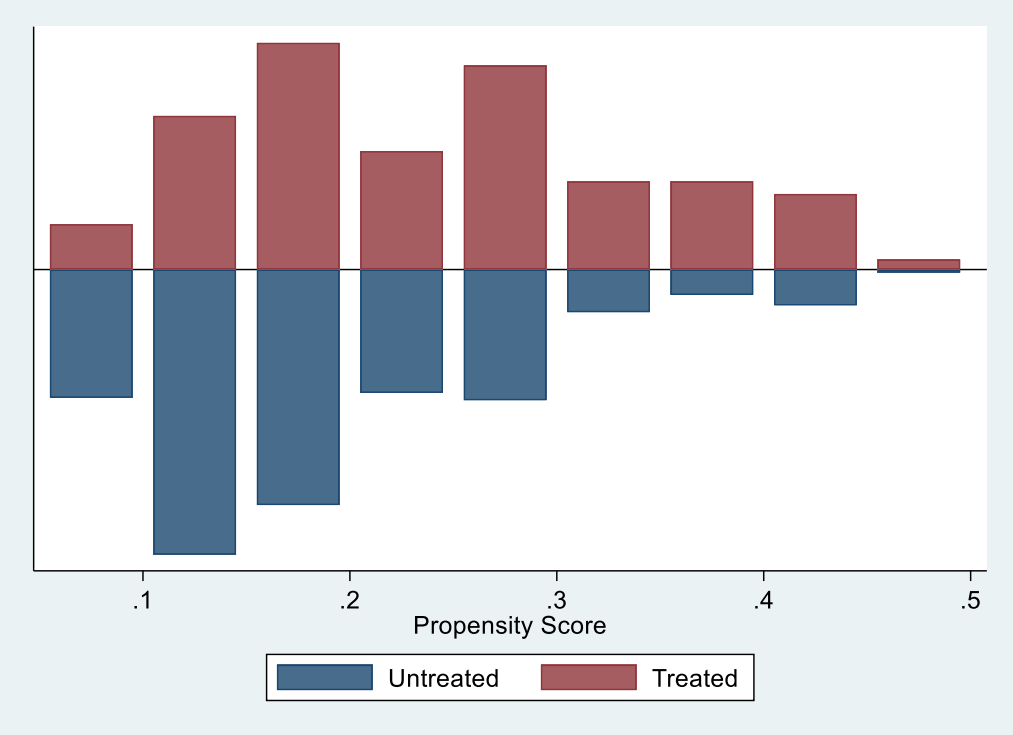

Figure A 4. Graph showing common support in the distribution of propensity score (treatment variable is 1 if the business receives payment via mobile money regularly/occasionally).

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