**Does financial inclusion influence the productivity of micro, small, and medium enterprises in Malawi?**

**Abstract**

Financial inclusion fosters inclusive economic development and enterprise growth. However, research on financial inclusion and firm productivity in developing countries remains limited. Therefore, this study aims to determine how access to and use of savings, credit, and insurance services impact the profit efficiency levels of micro, small, and medium enterprises (MSMEs). Specifically, it evaluates how financial inclusion among MSMEs in Malawi affects their profit efficiency. This study examines various aspects of financial inclusion, including access to and use of savings, credit, insurance, and banking services, and how they influence the profit efficiency levels of MSMEs. The research utilizes data from the 2019 Malawi MSME Survey by FinScope on financial inclusion, which employed a multi-stage sampling technique targeting 2,992 MSMEs as respondents. An Endogenous Switching Regression (ESR) model was employed, allowing for the joint estimation of financial inclusion selection and its impact on profit efficiency. The study reveals that financial inclusion significantly affects the profit efficiency of MSMEs in Malawi. In particular, the overall uptake of financial services, credit access, and savings corresponds to 23. 9%, 26.7. 7%, and 24.6. 6% of profit efficiency, respectively. Government support, business registration, available infrastructure, and prior business experience further enhance this effect, indicating that financial inclusion complements factors contributing to enterprise profit efficiency. Based on these findings, the government is urged to adopt a comprehensive strategy to expand financial inclusion. This includes making affordable financial services accessible to the public, formally establishing and promoting MSME institutions like the Small and Medium Enterprise Development Institute (SMEDI), and improving basic infrastructure such as digital services and water access. Streamlining business registration and providing incentives for financial record-keeping can also facilitate greater access to formal financing. These strategies will likely boost financial inclusion, enhance profitability, and promote firm growth.

**Key Words:** Financial inclusion, productivity, profit efficiency, MSME

**1.0 Introduction**

Financial inclusion fosters economic growth and reduces poverty (Demirgüç-Kunt et al., 2018). Research shows enhanced financial access addresses multiple developmental goals (Demirgüç-Kunt et al., 2020). These goals include poverty alleviation, equitable income distribution (Demir et al., 2020), and improved welfare outcomes such as nutrition, healthcare, and education (Kabakova & Plaksenkov, 2018). Additionally, it contributes to economic prosperity and supports achieving sustainability objectives (Adegbite & Machethe, 2020; Chibba, 2009; Pradhan et al., 2021). However, in many countries, particularly in rural or remote areas, poor, marginalized, and vulnerable groups face barriers to formal financial services (Koomson et al., 2020). The formal financial services available to micro, small, and medium-sized enterprises (MSMEs) remain underutilized, leading to substantial financial challenges for these businesses (World Bank, 2022). This research will explore how financial inclusion impacts the productivity of MSMEs in Malawi, focusing on credit, savings, and insurance services. A disparity in access to formal financial services persists despite the growing presence of mobile money: only 54% of MSMEs engage with formal financial services, 47% have bank accounts, and fewer than 40% access official credit in Malawi (SIVIO Institute, 2024; Reserve Bank of Malawi, 2023). This analysis supports policies that promote inclusive financial enterprise development and growth.

Increasing literature suggests that financial services can enhance the productivity and growth of MSMEs (Kuada, 2022; Sanga & Aziakpono, 2022). Despite a few exceptions, scholarly research on financial inclusion and MSME productivity in developing countries remains limited. Most studies concentrate on advanced nations (Xia, Mourtzis, and Dong, 2022). The importance of MSMEs in developing countries creates a significant gap. Furthermore, most empirical studies focus on general productivity indicators such as sales growth, business longevity, or employment (Ayyagari et al., 2011; McKenzie & Woodruff, 2014), while largely overlooking profit efficiency, a strong measure of productivity that considers input optimization alongside output maximization. Profit efficiency assesses how effectively an enterprise generates profits by considering market prices, technology, and available inputs (Farrell, 1957; Kumbhakar & Lovell, 2000). This is vital for MSMEs in developing economies, where structural resource and market imperfections lead to inefficient resource pricing and allocation behavior (Coelli et al., 2005; Duygun et al., 2013). Moreover, profit efficiency further accounts for variations in production processes among firms, addressing the diverse operational realities of MSMEs in Malawi (Brümmer & Loy, 2000). Unlike traditional performance indicators emphasizing output, profit efficiency includes costs and revenues, reflecting minimization and maximization, respectively (Lensink et al., 2008; Rahman et al., 2020).

Furthermore, while several studies find that access to finance benefits a nation economically and promotes poverty reduction within that country’s borders, many of these papers appear to have identification issues and fail to establish a causal link between finance and economic outcomes (Honohan, 2004; Beck et al., 2007; and Demirguc-Kunt et al 2008). The studies heavily rely on correlational methods, such as OLS, probit, and logit models, along with matching techniques like propensity score matching, which do not adequately address endogeneity (Cull et al., 2014). This endogeneity includes unobservable firm attributes, such as managerial skill or innovation, that can influence financial access and productivity (Banerjee & Duflo, 2014). To address these gaps, this study will employ an endogenous switching regression (ESR) model to correct selection bias and capture the diverse effects of financial services on firm productivity, using profit efficiency as a proxy indicator.

**2.0 Literature review**

Demirgüç-Kunt et al. (2018) characterize financial inclusion as encompassing all aspects of credit, savings, insurance, and payment systems. Beck et al. (2007) note that financial inclusion influences business capital, liquidity, and risk management. Profit efficiency, which integrates technical and allocative efficiency, evaluates a firm's ability to maximize profits relative to its costs and the market prices of its products (Farrell, 1957; Kumbhakar et al., 2015). Regarding profit efficiency, financial inclusion enhances businesses’ protective strategies, facilitating effective resource allocation, adopting supportive technologies, and fostering greater resilience against financial shocks. Literature emphasizes the importance of finance in improving a firm’s performance. Beck and Demirgüç-Kunt (2006) observed that financial infrastructure strengthens business activity and economic diversification. Ayyagari et al. (2011) analyzed data from over 100 countries and indicated that access to credit supports job creation and business growth, particularly for MSMEs. Numerous studies have explored the effects of financial inclusion on various outcomes, such as firm performance (Chauvet & Jacolin, 2017), economic growth (Kim et al., 2018), inequality and stability (Neame & Gaysset, 2018), bank stability (Ahmed & Malik, 2019), sales growth in emerging markets (Lee et al., 2020), economic growth in sub-Saharan Africa (Adedonkun & Aga, 2021), and agricultural total factor productivity (Hu et al., 2021). Nonetheless, many studies overlook profit efficiency, focusing instead on sales, employment, and survival.

The effect of financial inclusion on MSMEs depends on the context. While microfinance strengthens investment and resilience within firms, as McKenzie and Woodruff (2014) noted, it does not improve profitability. In their controlled randomized study, Banerjee et al. (2015) reported that removing credit constraints spurred business activities in India but did not increase household consumption or long-term profitability. In contrast, some studies by Karlan et al. (2014) and Dupas and Robinson (2013) show that having a savings account increases microenterprise investment and income. Furthermore, Beck et al. (2009) demonstrate that credit lines and overdraft facilities enhance the productivity and competitiveness of businesses in developing countries. These differences reflect variations in outcomes based on age, location, culture, and sector, with limited information available for people in Sub-Saharan Africa. Giné and Yang (2009) studied farming households in Malawi and found that weather-indexed insurance increased investment in risky and more profitable crops. As Chikalipah (2017) argued, a lack of trust in institutions, high transaction costs, and low levels of financial education undermine the effectiveness of financing services for businesses.

**2.0 Methodology**

***2.1 Data and sources***

This study is based on the FinScope Malawi MSME Survey from 2019, which outlines the landscape of MSMEs in Malawi. It includes a nationwide representative sample of 2,992 MSMEs used for the study. It provides region-specific data on financial inclusion, operational activities, and demographic information (FinMark Trust, 2020). The survey utilized a multi-stage stratified sampling procedure. In the first step, there was a comprehensive listing of households in 1,110 Enumeration Areas (EAs), from which business owners were sampled later. The sample consisted of individuals over 18 years who self-identified as business owners or as those engaged in some income-generating activity, regardless of whether they employed others. According to Malawi's definition of MSMEs, enterprises with up to 100 employees were included. The 982,993,000 MSME owners were identified through a qualified sampling frame. In collaboration with the National Statistical Office (NSO) of Malawi and Microfinance Opportunities, FinMark Trust conducted 10,474 interviews. The survey employed a pre-tested framework alongside rigorous qualitative validation measures to ensure consistent data accuracy.

Gathering precise operational or financial data continues to be challenging due to the informal and complex nature of many MSMEs. Consequently, surveys like FinScope provide crucial subjective and perceptual insights that often exceed the utility of formal financial statements (Sirec & Močnik, 2010). Research such as Okpara (2011) also emphasizes the importance of capturing MSMEs' perceived financial and strategic aspects, as many operate without dedicated accounting systems. FinScope data are essential for understanding entrepreneurs' financial behaviors and constraints, allowing policymakers and financial service providers to develop more appropriately designed interventions (FinMark Trust, 2020; Chikoko & Chipeta, 2021). These surveys remain the most valuable data source for MSME research and policy formulation in developing economies, which generally exhibit high informality and inadequate record-keeping.

***2.2 Identification strategy***

The study seeks to establish a causal link between financial inclusion and the profit efficiency of MSMEs. In this study, financial inclusion encompasses the uptake and use of financial services such as savings, credit, and insurance by MSMEs. Establishing the causal link, however, faces challenges such as endogeneity, sample selection bias, and unobserved heterogeneity. These challenges arise from the fact that firms do not access financial services randomly; they tend to self-select into financial markets based on observable traits like location, firm size, and owners’ educational background, as well as unobservable factors such as entrepreneurial skills and risk preferences (Wooldridge, 2010). These unobservable elements may influence the likelihood of achieving financial inclusion and a firm's profit efficiency, resulting in bias within OLS regression outcomes. Consequently, this study employs an endogenous switching regression model to account for observable and unobservable factors affecting financial inclusion and profit efficiency (Maddala, 1983; Lokshin & Sajaia, 2004).

**2.3 Empirical Strategy**

***2.2.1 Endogenous Switching Regression***

An endogenous switching regression consists of two stages (Malikov & Kumbhakar, 2018; Kassie, Jaleta, and Mattei, 2014). In the first stage, a probit estimator is used to identify the determinants of financial inclusion. The selection equation is specified as follows (DiFalco, Veronesi, and Yesuf, 2011):

(1)

Where refers to a binary variable that equals one if the firm is using a particular financial service and equals zero otherwise; 𝛼 is the intercept; X𝑖 is a set of external factors that influence the firm's financial inclusion (see appendix 1); 𝛾𝑖 refers to the set of parameters, while 𝜀𝑖 is the error term that has a mean of zero and constant variance.

To address selection bias, the study employs a full-information maximum likelihood (FIML) model in the second stage of the endogenous switching regression. The productivity outcomes (profit efficiency in firms) resulting from financial inclusion will be modelled as switching regimes as follows:

Regime 1: if = 1 for financially included firms (2)

Regime 2: if = 0 for financially excluded firms (3)

Yi represents profit efficiency as the outcome variables under each regime (1 = access to financial services, 0 = no financial services), and Zi is a vector of determinant factors hypothesised to influence profit efficiency outcomes (see Appendix 1). Equations (2) and (3) may utilise the same variables in vector Z as Xi in Equation (1). The approach necessitates at least one variable in X that is not found in Z, with parameters being estimated. In the profit efficiency estimation equation, u1i and u0i are independent and identically distributed error terms. In a two-stage estimating technique (endogenous switching regression), the Mills Ratio (IMR) of participation calculated from selection Equation (1) is incorporated into Equations (2) and (3) to address selection bias:

(4)

(5)

A non-zero covariance in the error terms of both the selection and outcome equations indicates selection bias; thus, the absence of the selection bias hypothesis would be disproven.

The error components, u1i and u0i, are intended to follow a trivariate normal distribution with a mean vector of zero and a covariance matrix, as defined in Lokshin and Sajaia (2004), as follows.

(6)

Error terms for the selection and outcome equations have a covariance structure (Ɛ, u) = ρ. Here and are the coefficients of correlation associated with u1i and Ɛi and with u0i and Ɛi, respectively. If and are significantly not equal to zero, there is selection bias. When ρ > 0, we have a negative selection bias. This means that firms with below-average profit efficiency are more likely to be financially included. A positive selection bias would suggest that ρ < 0, implying that firms with above-average profit efficiency are more likely to participate in export markets.

This study aims to measure the influence of financial inclusion on firm productivity by using profit efficiency as the outcome indicator, specifically the differences between financially included and excluded firms. Equations (7) – (10) present Yi (profit efficiency) as the average treatment impact. The equations for the expected conditional and average treatment effects of employed and non-engaged groups are:

The equation for firms that have access to financial services:

(7)

The equation for firms that do not provide financial services:

(8)

The equation for financially included firms when they decide to access financial services:

(9)

The equation for financially excluded firms which did not access the financial services:

(10)

The expected findings in Equations (7) — (10) will be used to calculate the impact of heterogeneity. The base heterogeneity of financially included enterprises is defined as (7) minus (9). The difference between (8) and (10) pertains to financially excluded enterprises.

***2.3.2***  ***Stochastic frontier analysis***

The study uses stochastic frontier analysis to determine the profit efficiency scores of firms, which are a proxy of firm productivity in this study. We define profit efficiency as the profit gained from operating on the profit frontier, taking into account prices and factors (Chen et al., 2015). A Stochastic Profit Frontier is the highest profit that can be received given the level of technology and input used. Equation (1) presents the stochastic profit frontier in implicit form.

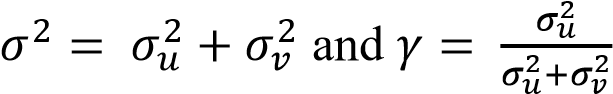
(11)

Where πi represents the profit of the ith firm; *lab cost* represents the labour input faced by the ith firm in Kwacha; *var cost* is the variable cost (other than labour) used by the ith firm; *fixed cost* is the level of the kth fixed cost in the ith farm; 𝜀𝑖 = is an error term, k = 1,2 and 3 and i =1…, 2992, is the number of MSME firms in the sample. 𝜀𝑖 is a composite error term that can be decomposed into two components, vi and ui. Deviation from the frontier due to random events is represented by vi  while ui~𝑁+(𝑢𝑖, 𝜎2) are deviations from the frontier due to inefficiency.

Based on equation (6), profit efficiency is the ratio between the firm’s profit and the maximum possible profit that a firm could have realized if it were efficient. The profit efficiency of firm *i* in the context of the stochastic frontier profit function (Coelli et al., 1998) is defined as:

(12)

Where E = Expected operator, Profit efficiency (PE) is achieved by obtaining expressions for the conditional expectation 𝑢𝑖 upon the observed value of 𝜀𝑖. Maximum likelihood estimates the unknown parameters, with the stochastic frontier and the inefficiency effects functions estimated simultaneously. The likelihood is expressed in terms of the variance parameters:

 (13)

Where 𝜎2 =Total variance for the combined error term 𝜀𝑖, Constant variance for the symmetric error term vi,  Constant variance for the symmetric error term ui, 𝛾 = ratio of farm-specific efficiency effects to the total output variance.

**Log-linear Cobb-Douglas regression model:** Equation 4 presents the MSMEs' stochastic profit frontier, which takes the form of a Cobb-Douglas function in log-linear form. Kotey and O’Donnell (2002) write that the productive inputs are used in the production function and transformed into the outputs. So, they used the prices of the inputs to estimate the changes in profit efficiency. A log-linear Cobb-Douglas form is used to specify the stochastic profit frontier after taking logarithms of the multiplicative production function (Aigner et al., 1977; Battese & Coelli, 1995). Thus, the proper specification is:"

(14)

Where: πi is the estimated profit for the ith firm in MK; β₀ represents the intercept (anti-log gives baseline efficiency); β₁-β₃ are output elasticities of inputs (labour cost *LabCi*, variable cost *VCi*, fixed cost *FCi*). The error term follows the conventional SFA decomposition: *vi*: Random noise ~ and *ui*: Inefficiency ~ (half-normal). The dependent variable π was calculated by subtracting all costs (labour costs, other variable costs, and fixed costs) from the revenues each firm registered (Purwanto et al., 2014; Álvarez & Crespi, 2003). Instead of running a profit inefficiency model (μi), this study used the efficiency scores in an endogenous switching regression model to determine the treatment effect of financial inclusion on profit efficiency scores.

2.4 **Instruments' validity and robustness checks**

The study employs having a business plan, non-mobile technology usage, business network membership, internet access, and keeping financial records as instrumental variables. The reasoning is theoretically confirmed because these factors enhance the organizational and social visibility of formal financial services. However, they are unlikely to directly impact profit efficiency after controlling for financial inclusion, thus fulfilling the exclusion restriction posed by Maddala (1983), Wooldridge (2010), Mendola (2007), Karlan & Morduch (2009), and Di Falco et al. (2011). The instruments’ statistical adequacy is evidenced by significant coefficients in the selection equation and strong joint F-tests. At the same time, theoretical validity is indicated by the absence of direct significance in the outcome equation (Smith & Blundell, 1986). The parameters athrho and rho in the ESR model test for endogenous selection, and the model is validated if athrho, which confirms the correlation of selection and outcome errors, is significant (Lokshin & Sajaia, 2004). The standard deviation of each regime’s residuals, captured by Sigma and lnsigma, is corrected for selection bias using the inverse Mills ratio, lambda. Together, these instruments and diagnostics create a robust identification framework that estimates the causal impact of financial inclusion on MSME profit efficiency.

In addition to ESR, this study estimated and assessed data using OLS, the tobit regression model, and Propensity Score Matching (PSM) to test model robustness. While OLS employs exogeneity as a reference point, the Tobit model considers efficiency scores constrained within 0-100%. The Heckman selection model addresses selection bias but does not capture treatment effect heterogeneity as effectively as the ESR (Endogenous Switching Regression) model (Heckman, 1979; Wooldridge, 2010). The PSM has a control group that does not participate, i.e., those not using financial services but possessing observable traits consistent with those of the participating firms. This allows us to create a matched sample that simulates an experimental situation (Rosenbaum & Rubin, 1983; Caliendo & Kopeinig, 2008).

**2.5Summary statistics of firms**

**Table 1** illustrates the significant differences in profit-related metrics between enterprises that engage with financial services and those that do not. As previously mentioned, users of financial services profited substantially more on average (MK 1,656,416) than non-users (MK 1,062,752); this difference was statistically significant (p = 0.019). Additionally, financially served enterprises also spent more on operations (MK 869,197 vs. MK 669,201), materials (MK 414,071 vs. MK 268,531), and labor (MK 405,966 vs. MK 135,320). The most striking difference was observed in labor costs (p < 0.001), suggesting higher employment or formal hiring levels among the firms included. Users of financial services also held greater assets, although this difference was not statistically significant (p = 0.148), indicating that the firms had diverse capital structures.

These findings support other literature indicating that financial inclusion enhances a business's performance by increasing access to capital for investment in productive assets and expanding the scale of operations (Beck, Demirgüç-Kunt, & Levine, 2007; Allen et al., 2016). Conversely, the rise in costs, possibly in labor and materials, which is subsidized by financial services, appears to extend the scope of business activities into more resource-intensive areas. The significant increase in profits, despite the rising costs, indicates enhanced profit efficiency, likely resulting from improved financial planning, risk management, and market opportunities provided by financial services (Bruhn & Love, 2014).

**Table 1**: Descriptive Estimates for Profit Efficiency Parameters and Financial Inclusion

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Financial services uptake** | |  |  |
| **Variable** | **No** | **Yes** | **Total** | **Test** |
| Sample | 1,773 (59.7%) | 1,197 (40.3%) | 2,970 (100.0%) |  |
| Profit (MK) | 1,062,752(3,891,398) | 1,656,416 (9,562,015) | 1,302,017 (6,778,953) | 0.019 |
| Operations cost (MK) | 669,201(3,381,887) | 869,197(3,145,462) | 749,805(3,289,571) | 0.104 |
| Materials cost (MK) | 268,531(957,286) | 414,071(2,620,897) | 327,188(1,821,842) | 0.033 |
| Labour cost (MK) | 135,320 (700,361) | 405,966 (2,701,119) | 244,398 (1,802,620) | <0.001 |
| Asset value (MK) | 6,774,171(32,549,708) | 16,118,018(28,765,395) | 12,300,102(30,546,677) | 0.148 |

Standard errors in parentheses: "\*p <0.05; \*\* p<0.1; and \*\*\* p<0.01” Source: Authors estimation

**Table 2** presents the descriptive statistics for the covariates used in the Endogenous Switching Regression (ESR) model and indicates that most enterprises operate with low formal support and infrastructure. For example, only 0.7% of the sample reported receiving support from the Small and Medium Enterprise Development (SMED) program, and only 17% were formally registered. Similarly, 44.5% of firms with access to electricity and 21.3% with access to piped water are also low, demonstrating many businesses' infrastructural constraints. Although the use of technology is reported to be high at 82.8%, more advanced or non-mobile technologies were even less adopted at 13.8%, with internet access at only 2.3%. Furthermore, just 8.4% of the sample reported having a business plan, and 4% indicated membership in a business network, suggesting low levels of strategic planning and collaboration beyond their organization. This reflects a considerable degree of under-institutionalization and under-capacity, which is documented to have a significant impact on the efficiency of firms and their ability to access financial services (Ayyagari, Demirgüç-Kunt, & Maksimovic, 2011; La Porta & Shleifer, 2014).

**Table 2:** Descriptive statistics of covariates in the ESR model

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Description** | **Obs** | **Mean** | **Std. dev.** | **Min** | **Max** |
| SMED helped | 1=yes | 2,970 | 0.007 | 0.086 | 0 | 1 |
| Business years | Number | 2,666 | 7.526 | 6.693 | 1 | 48 |
| Business registration | 1=yes | 2,970 | 0.170 | 0.376 | 0 | 1 |
| Electricity | 1=yes | 2,970 | 0.445 | 0.497 | 0 | 1 |
| Piped water | 1=yes | 2,970 | 0.213 | 0.410 | 0 | 1 |
| Technology use | 1=yes | 2,970 | 0.828 | 0.377 | 0 | 1 |
| Total employees | Number | 2,970 | 1.208 | 3.603 | 0 | 60 |
| Business network | 1=yes | 2,970 | 0.193 | 0.395 | 0 | 1 |
| Business plan | 1=yes | 2,970 | 0.084 | 0.277 | 0 | 1 |
| Technology use | 1=yes | 2,970 | 0.828 | 0.377 | 0 | 1 |
| Tech use, not mobile | 1=yes | 2,970 | 0.138 | 0.345 | 0 | 1 |
| Business network | 1=yes | 2,970 | 0.040 | 0.195 | 0 | 1 |
| Internet access | 1=yes | 2,970 | 0.023 | 0.150 | 0 | 1 |
| Financial records | 1=yes | 2,970 | 0.480 | 0.500 | 0 | 1 |

**4.0 Results and discussion**

***4.1 Profit efficiency scores from the stochastic frontier analysis***

Table 3 outlines descriptive statistics where the mean and standard deviation of profit efficiency are presented by firm size and their corresponding financial service access, including financial service use (FSU), credit, savings, and insurance. The data suggests macro firms tend to have much higher profit efficiency than micro and small firms. However, the level of financial service access sometimes correlates with a reduction in profit efficiency, especially among macro firms. For example, macro firms that access insurance services show profit efficiency (M = 27.205, SD = 27.840), which is significantly lower than those that do not (M = 44.706, SD = 25.308), with a significant difference (p < .001). Likewise, macro firms having access to FSU also exhibit decreased profit efficiency (p = .009). These findings highlight that the link between financial inclusion and firm efficiency depends on firm size and the specific financial service utilized, suggesting a complex and non-linear relationship (Beck, Demirgüç-Kunt, & Maksimovic, 2005; World Bank, 2022).

**Table 3:** Distribution of Profit efficiency scores among firms

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Firm size** | **No** | **Yes** | **Total** | **Test** |
| FSU | Micro | 9.11 (11.781) | 9.875 (12.409) | 9.402 (12.026) | 0.219 |
|  | Small | 9.963 (14.128) | 10.638 (14.590) | 10.241 (14.318) | 0.422 |
|  | Macro | 46.459 (25.315) | 36.134 (27.220) | 40.956 (26.778) | 0.009 |
| Credit | Micro | 9.291 (12.113) | 9.747 (11.760) | 9.402 (12.026) | 0.517 |
|  | Small | 10.224 (14.333) | 10.289 (14.300) | 10.241 (14.318) | 0.944 |
|  | Macro | 42.543 (26.465) | 35.667 (27.453) | 40.956 (26.778) | 0.145 |
| Savings | Micro | 9.527 (12.016) | 9.149 (12.054) | 9.402 (12.026) | 0.556 |
|  | Small | 10.330 (14.372) | 10.063 (14.226) | 10.241 (14.318) | 0.761 |
|  | Macro | 42.809 (26.727) | 38.125 (26.793) | 40.956 (26.778) | 0.25 |
| Insurance | Micro | 9.114 (11.739) | 16.061 (16.111) | 9.402 (12.026) | <0.001 |
|  | Small | 10.053 (14.006) | 11.966 (16.881) | 10.241 (14.318) | 0.168 |
|  | Macro | 44.706 (25.308) | 27.205 (27.840) | 40.956 (26.778) | <0.001 |

***4.3 Endogenous treatment effect of financial services uptake on profit efficiency***

The ESR model results from Table 4 indicate a significantly positive relationship between the use of financial services and profit efficiency scores. More specifically, the estimates for overall financial services access, credit, and savings are positive and significant at the one percent level (p < .01), suggesting that businesses utilizing these services are more profit-efficient. For example, access to financial services is associated with a 23.9% increase in the efficiency score, compared to credit and savings, which correlate with increases of 26.7% and 24.6%, respectively. Conversely, insurance uptake, while positively correlated, is not statistically significant in its impact on efficiency (p > .05). These results reinforce the existing literature that associates financial inclusion with enhanced enterprise productivity, investment, and risk diversification coverage (Beck, Demirgüç-Kunt, & Levine, 2007; Karlan & Morduch, 2010). Additionally, SMED support, business experience, and access to piped water significantly relate to higher efficiency, underscoring the role of institutional support and infrastructure (La Porta & Shleifer, 2014).

**Table 4:** Results of the ESR and comparative models (OLS, Tobit, and PSM)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **PE\* scores vs overall FSU** | | **PE\* scores vs Credit** | | **PE\* scores vs Savings** | | **PE\* scores vs Insurance** | |
| **OLS model.** |  | |  | |  | |  | |
| Financial services | 0.003 |  | -0.011 |  | -0.002 |  | 0.022 |  |
| Intercept | 0.073 | \*\* | 0.076 | \*\* | 0.075 | \*\* | 0.074 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  |
| **Tobit regression model.** | | | | | | | | |
| Financial services | 0.004 |  | -0.011 |  | -0.002 |  | 0.022 |  |
|  | (0.006) |  | (0.007) |  | (0.007) |  | (0.013) |  |
| Intercept | 0.073 | \*\* | 0.076 | \*\* | 0.075 | \*\* | 0.074 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  |
| var(e.eff\_G\_1) | 0.025 |  | 0.025 |  | 0.025 |  | 0.025 |  |
|  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  |
|  |  |  |  |  |  |  |  |  |
| **ESR model** |  | |  | |  | |  | |
| Yes = Financial services | 0.239 | \*\* | 0.267 | \*\* | 0.246 | \*\* | 0.018 |  |
|  | (0.014) |  | (0.010) |  | (0.012) |  | (0.027) |  |
|  |  |  |  |  |  |  |  |  |
| Intercept | 0.004 |  | 0.034 | \*\* | 0.007 |  | 0.078 | \*\* |
|  | (0.011) |  | (0.010) |  | (0.011) |  | (0.009) |  |
| Intercept-selection model | -0.506 | \*\* | -0.841 | \*\* | -0.541 | \*\* | -2.074 | \*\* |
|  | (0.061) |  | (0.065) |  | (0.061) |  | (0.125) |  |
|  |  |  |  |  |  |  |  |  |
| **PSM model** |  |  |  |  |  |  |  |  |
| Unmatched | 0.1232 |  | 0.1144 |  | 0.1161 |  | 0.1585 | \*\* |
|  | (0.0060) |  | (0.0068) |  | (0.0063) |  | (0.0112) |  |
| ATT | 0.1232 |  | 0.1144 |  | 0.1161 |  | 0.1134 |  |
|  | (0.0073) |  | (0.0062) |  | (0.0057) |  | (0.0393) |  |
|  |  |  |  |  |  |  |  |  |
| Number of observations | 2666 |  | 2666 |  | 2666 |  | 2666 |  |

\* PE stands for Profit Efficiency \*\* p<.01, \* p<.05

***4.3 Robustness checks***

**Table 4** indicates that the financial services utilization coefficient was consistently considered statistically insignificant, implying no treatment effects when selection bias is not adequately addressed in the OLS and Tobit models. For example, financial service utilization did not positively influence profit efficiency in the OLS and Tobit models (β = 0.003 and 0.004 with SE = 0.006 for both), demonstrating a lack of impact (see **appendices 7-8**). Unlike other models, the ESR model approaches financial inclusion decisions uniquely by simultaneously considering participation and outcome equations. This method excludes unobserved latent differences within a population and assumes that error terms are random and correlated (Lokshin & Sajaia, 2004; Di Falco, Veronesi, & Yesuf, 2011). The results of ESR also revealed significant variations in the effects of treatments on profit efficiency among firms utilizing insured and banking services, which experienced substantial gains. These gains were obscured in the OLS single-equation system and Tobit models due to their failure to account for treatment effect heterogeneity and selection biases, thus limiting their applicability (Maddala, 1983; Wooldridge, 2010). Simpler models can serve as helpful benchmarks, but the lack of consideration for unobservable selection may lead to biased treatment effects. By relying on the unrestricted ESR model, the framework offers a more appropriate strategy for estimating the complex impacts that financial services uptake has on MSMEs’ productivity in Malawi.

The results of the PSM model (**Table 4),** which provides a robustness check for the effects of financial services uptake on firm profit efficiency, show that for most categories, the ATT estimates are statistically insignificant because of extremely low in t-values (e.g., FSU: t = 1.46; credit: t = 0.51; savings: t = 0.17; insurance: t = 1.15) (**Appendix 6**). These estimates indicate no substantial evidence that firms' profit efficiency improved with the uptake of financial services after matching (**Appendices 3-4**). However, these findings sharply contrast with the results from the ESR model, our main specification, where all other financial services, except for insurance, were found to have statistically significant positive impacts on efficiency (FSU: 0.239, p<.01; credit: 0.267, p<.01; savings: 0.246, p<.01). This discrepancy indicates that while PSM adjusts for only observable confounders (Rosenbaum & Rubin, 1983), the ESR model accounts for both unobservable and observable heterogeneity (Lokshin & Sajaia, 2004), such as entrepreneurial or financial skills. That suggests that firms engaging with financial services may possess unexplained factors that PSM does not account for.

***4.4 Instruments validity***

**Table 5** indicates that the uptake of financial services shows significant selection bias, as evidenced by athrho of -0.975 (p<0.01), which justifies the use of ESR (Lokshin & Sajaia, 2004). Rho values reflect the negative relationship and correlation of unobservable factors influencing selection and outcome. This indicates that the effect of financial services on profit efficiency would be inaccurately estimated if the bias is not addressed. Lambda, or the Inverse Mills Ratio, captures the expected value of the selection bias term, and its significance further reinforces the necessity of controlling for endogeneity stemming from non-random participation (Maddala, 1983).

The lnsigma and sigma parameters represent the standard deviation of residuals in the outcome equations **(Table 5**). Their significance indicates model precision while highlighting that the lnsigma values were also significantly estimated (all p < .01). The sigma values, such as 0.197 for financial services uptake, provide insight into the variability of efficiency scores after selection correction. However, the significance of athrho and lambda sustains the ESR structure, confirming the argument for the relevance of exclusion restrictions or instruments. The *business network, internet access, and keeping financial records* are significant predictors of the selection equation. They are uncorrelated with other key predictors in the outcome equation, such as SMED helped or business years, which allows them to attain and directly influence efficiency scores, thus meeting the exogeneity criteria (Wooldridge, 2010; Di Falco et al., 2011). These instrument behaviors strengthen the defense for the relationship between financial service uptake and firm efficiency by clarifying the effects of financial service uptake on firm efficiency.

**Table 5.** Results of the Endogenous Switching Regression Model.

| **Variables** | **PE scores vs FSU** | | **PE scores vs Credit** | | **PE scores vs Savings** | | **PE scores vs Insurance** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SMED helped | 0.101 | \*\* | 0.106 | \*\* | 0.102 | \*\* | 0.108 | \*\* |
|  | (0.034) |  | (0.031) |  | (0.033) |  | (0.035) |  |
| Business years | 0.002 | \*\* | 0.001 | \*\* | 0.001 | \*\* | 0.001 | \*\* |
|  | (0.000) |  | (0.000) |  | (0.000) |  | (0.000) |  |
| Business registration | 0.008 |  | 0.029 | \*\* | 0.043 | \*\* | 0.039 | \*\* |
|  | (0.011) |  | (0.011) |  | (0.011) |  | (0.011) |  |
| Electricity | -0.007 |  | -0.007 |  | -0.006 |  | -0.005 |  |
|  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  |
| Piped water access | 0.029 | \*\* | 0.026 | \*\* | 0.031 | \*\* | 0.035 | \*\* |
|  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  |
| Technology use | 0.001 |  | -0.003 |  | 0.007 |  | 0.018 | \* |
|  | (0.010) |  | (0.010) |  | (0.010) |  | (0.008) |  |
| Total employees | -0.001 |  | 0.000 |  | -0.000 |  | -0.001 |  |
|  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  |
| Business equipment | -0.002 |  | 0.001 |  | -0.003 |  | -0.000 |  |
|  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  |
| Yes = Financial services uptake, Credit access, Savings access, Insurance | 0.239 | \*\* | 0.267 | \*\* | 0.246 | \*\* | 0.018 |  |
|  | (0.014) |  | (0.010) |  | (0.012) |  | (0.027) |  |
|  |  |  |  |  |  |  |  |  |
| Intercept | 0.004 |  | 0.034 | \*\* | 0.007 |  | 0.078 | \*\* |
|  | (0.011) |  | (0.010) |  | (0.011) |  | (0.009) |  |
| **Selection Model** | **Financial services uptake** | | **Credit access** | | **Savings access** | | **Insurance** | |
| Business registration | 0.298 | \*\* | 0.041 |  | -0.089 |  | 0.971 | \*\* |
|  | (0.068) |  | (0.068) |  | (0.069) |  | (0.090) |  |
| Technology use | 0.184 | \*\* | 0.181 | \*\* | 0.145 | \* | 0.092 |  |
|  | (0.066) |  | (0.069) |  | (0.066) |  | (0.131) |  |
| Business plan | 0.133 |  | 0.036 |  | 0.135 |  | 0.385 | \*\* |
|  | (0.080) |  | (0.072) |  | (0.078) |  | (0.120) |  |
| Technology-not mobile | -0.030 |  | -0.021 |  | -0.136 | \* | 0.409 | \*\* |
|  | (0.065) |  | (0.061) |  | (0.066) |  | (0.107) |  |
| Business network | 0.431 | \*\* | 0.222 | \* | 0.432 | \*\* | 0.113 |  |
|  | (0.102) |  | (0.094) |  | (0.095) |  | (0.170) |  |
| Internet access | 0.458 | \*\* | 0.497 | \*\* | 0.257 |  | 0.410 | \* |
|  | (0.144) |  | (0.115) |  | (0.140) |  | (0.193) |  |
| Keep financial records | 0.091 | \* | 0.106 | \*\* | 0.047 |  | 0.145 |  |
|  | (0.041) |  | (0.039) |  | (0.041) |  | (0.090) |  |
| Intercept | -0.506 | \*\* | -0.841 | \*\* | -0.541 | \*\* | -2.074 | \*\* |
|  | (0.061) |  | (0.065) |  | (0.061) |  | (0.125) |  |
| athrho | -0.975 | \*\* | -1.248 | \*\* | -1.040 | \*\* | 0.014 |  |
|  | (0.061) |  | (0.046) |  | (0.052) |  | (0.080) |  |
| lnsigma | -1.626 | \*\* | -1.609 | \*\* | -1.619 | \*\* | -1.831 | \*\* |
|  | (0.025) |  | (0.019) |  | (0.022) |  | (0.014) |  |
| rho | -0.751 |  | -0.848 |  | -0.778 |  | 0.014 |  |
|  | (0.027) |  | (0.013) |  | (0.021) |  | (0.080) |  |
| sigma | 0.197 |  | 0.200 |  | 0.198 |  | 0.160 |  |
|  | (0.005) |  | (0.004) |  | (0.004) |  | (0.002) |  |
| lambda | -0.148 |  | -0.170 |  | -0.154 |  | 0.002 |  |
|  | (0.008) |  | (0.005) |  | (0.007) |  | (0.013) |  |
| Number of observations | 2666 |  | 2666 |  | 2666 |  | 2666 |  |

\*\* p<.01, \* p<.05

The findings from the ESR model for covariates reveal several significant factors that positively impact profit efficiency within the first-stage outcome equation (**Table 5**). Government support (SMED) to MSMEs is positive (p < .01), emphasizing the importance of assistance for enterprise profit (Hall & Lerner, 2010). Business experience (in years) also has a positive effect on efficiency (p < .01), suggesting that greater operational maturity leads to improved resource allocation and performance (Evans, 1987). Business registration is essential in the credit, savings, and insurance models, indicating that formalization enhances access, perception of opportunities, and credibility, thereby improving profit efficiency (McKenzie & Sakho, 2010). Furthermore, access to piped water is significant in all models (p < .01), highlighting the role of infrastructure in supporting systematic business activities that require ongoing sanitation maintenance (Calderón & Servén, 2010).

The selection model (**Table 5**) identifies the key drivers of financial service usage. Business registration and business networks exhibit a strong relationship with the use of financial services, credit, and savings (p < .01), indicating that businesses with formal registration and robust professional connections are more likely to be financially included, supported by evidence of network effects in credit access (Banerjee & Duflo, 2014). Furthermore, technology adoption, particularly the internet, predicts engagement across various models, suggesting that connectivity allows digitally active firms to interact with formal financial institutions (Aker et al., 2016). Additionally, keeping financial records is closely associated with the use of financial services and credit (p < .05), highlighting the significance of financial education, literacy, and transparency in overcoming credit access barriers (Bruhn & Love, 2014).

**5.0 Conclusion and policy recommendations**

Incorporating finance into global development frameworks is crucial for fostering inclusive economic growth and alleviating poverty. Efforts are being made to enhance access in Malawi; however, the productivity gap between included and excluded MSMEs is still not fully understood. This work analyzes how financial inclusion affects the profit efficiency of Micro, Small, and Medium-Sized Enterprises in Malawi. This study explores all facets of financial inclusion and its impact on the profit efficiency of MSMEs, which includes access to and use of savings, lending, insurance, and banking services. The study's data is derived from the 2019 FinScope: Malawi MSME Survey on Financial Inclusion, which employed a multi-stage sampling scheme, targeting 2,992 MSMEs through random and purposive sampling. The data captures levels of financial inclusion, operational activity, and some basic socio-economic characteristics of these MSMEs. An endogenous switching regression (ESR) model was used to consider the joint effect of the decision to engage in financial inclusion and its impact on profit efficiency.

The endogenous switching regression (ESR) model results were conclusive: the uptake of financial services significantly improves enterprise profit efficiency. More specifically, access to financial services, credit, and savings contributed positively and significantly to increased profit efficiency scores, implying that greater financial inclusion enhances resource allocation, risk management, and operational expansion. Seemingly, self-selection bias, indicated by the negative and significant correlation coefficients (rho) revealed in the financial services credit and savings models, suggests that unobserved effects influence the decision for financial service access and efficiency results. This supports the case for using the ESR and similar models that eliminate such biases to provide accurate impact estimates. Additionally, firm characteristics such as SMED support, entrepreneurial duration, and access to infrastructural facilities like piped water enhanced efficiency, demonstrating deep insights into the multifactor nature of enterprise performance.

Based on these findings, the government is urged to adopt a comprehensive strategy to expand financial inclusion. This includes making affordable financial services accessible to the public, formally establishing and promoting MSME institutions like SMED, and improving basic infrastructure such as digital services and water access. Streamlining business registration and providing incentives for financial record-keeping can also facilitate greater access to formal financing. These strategies will likely boost financial inclusion, enhance profitability, and promote firm growth.

**6.0 Limitations of the study**

Although the study accounted for potential selection on unobservables that influence the decision to access finance and profit efficiency, it is essential to acknowledge possible limitations. One notable limitation is the dataset itself; the study used cross-sectional data, which makes it challenging to control for firm-specific unobserved heterogeneity compared to panel data. Furthermore, since the chosen instruments of *business networks, internet access, and maintaining financial records* rely on observational data, the estimates are unlikely to be causal. This study, therefore, acknowledges that to obtain causal estimates, not only is panel data necessary, as explained, but also the application of stronger models like the difference-in-differences (DiD), which would require assessing policy changes as treatment. Since 2014, two critical policies have been foundational in explaining financial services uptake in Malawi; therefore, evaluating how the same affects profit efficiency among small-scale firms would be helpful.

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**Appendix 1: Table: Profit Efficiency variable definition and measurement**

| **SN** | **Variable name** | **Measurement** |
| --- | --- | --- |
| **A.** | **Outcome variables/ productivity measures** |  |
| 1 | Profit Efficiency | It is calculated by comparing a company's profit to its maximum potential profit. It is calculated using the Stochastic Profit Frontier (SPF) model, which uses **labour**, **materials**, **operations**, and **fixed costs**. |
| **B** | **Covariates** |  |
| **1** | SMED helped | 1=yes and 0=no |
| **2** | Business years | Years |
| 3 | Business registration | 1= registered and 0 = not |
| 4 | Electricity | 1= grid connected and 0 = no |
| 5 | Piped water access | 1= connected and 0 = no |
| 5 | Technology use | 1=yes and 0 = no |
| 6 | Total employees | number |
| 7 | Business equipment | 1= has equipment and 0 = no |

**Appendix 2: Table: Financial services uptake variable definition and measurement**

| **SN** | **Variable name** | **Measurement** |
| --- | --- | --- |
| **A** | **Treatment Variable** |  |
| 1 | Financial services uptake | A binary measure calculated from combining credit, savings, and insurance. 1= yes and 0 = no |
| 2 | Credit access | 1= yes and 0 = no |
| 3 | Savings | 1= yes and 0 = no |
| 4 | Insurance | 1= yes and 0 = no |
| **B** | **Covariates** |  |
| 1 | Business registration | 1= registered and 0 = no |
| 2 | Technology use | 1= yes and 0 = no |
| 3 | Business plan | 1= yes and 0 = no |
| 3 | Financial records | 1=keep record 0 = does not |
| 4 | Internet access | 1= use internet 0 = no internet |
| 5 | Business network | 1= yes and 0 = no |
| 6 | Technology not mobile | 1= yes and 0 = no |
| 7 | Financial Literacy Training | 1= yes and 0=no |

**Appendix 3: Matching Testing of Propensity Scores of firms accessing financial services and those that do not**



Source: Author estimation.

**Appendix 4: Common support region**



**Appendix 5: Distribution of firm-specific profit efficiency scores (%)**

**Appendix 6: Average treatment effects from various Propensity Score Matching techniques**

| **Variable** | **Sample** | **Treated** | **Controls** | **Difference** | **S.E.** | **T stat** |
| --- | --- | --- | --- | --- | --- | --- |
| n(5) common | Unmatched | 0.1232 | 0.112 | 0.011 | 0.006 | 1.78 |
|  | ATT | 0.1232 | 0.205 | -0.082 | 0.033 | 2.48 |
| radius common | Unmatched | 0.1232 | 0.112 | 0.011 | 0.006 | 1.78 |
|  | ATT | 0.1232 | 0.112 | 0.011 | 0.005 | 2.03 |
| kernel | Unmatched | 0.1232 | 0.112 | 0.011 | 0.006 | 1.78 |
|  | ATT | 0.1232 | 0.118 | 0.005 | 0.006 | 0.74 |
| llr common | Unmatched | 0.1232 | 0.112 | 0.011 | 0.006 | 1.78 |
|  | ATT | 0.1232 | 0.118 | 0.005 | 0.070 | 0.07 |

**Appendix 7. OLS Model Results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **PE scores vs overall FSU services** | | **PE scores vs overall Credit** | | **PE scores vs overall Savings** | | **PE scores vs overall Insurance** | | **PE scores vs overall Banking** | |
| Financial services (FSU, Credit, Savings, Insurance, and Banking) | 0.003 |  | -0.011 |  | -0.002 |  | 0.022 |  | 0.011 |  |
|  | (0.006) |  | (0.007) |  | (0.007) |  | (0.013) |  | (0.009) |  |
| SMED helped | 0.100 | \*\* | 0.101 | \*\* | 0.101 | \*\* | 0.100 | \*\* | 0.100 | \*\* |
|  | (0.035) |  | (0.035) |  | (0.035) |  | (0.035) |  | (0.035) |  |
| Business years | 0.001 | \*\* | 0.001 | \*\* | 0.001 | \*\* | 0.001 | \*\* | 0.001 | \*\* |
|  | (0.000) |  | (0.000) |  | (0.000) |  | (0.000) |  | (0.000) |  |
| Business registration | 0.042 | \*\* | 0.043 | \*\* | 0.043 | \*\* | 0.039 | \*\* | 0.042 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.010) |  | (0.009) |  |
| Electricity | -0.003 |  | -0.004 |  | -0.004 |  | -0.003 |  | -0.004 |  |
|  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  |
| Piped water access | 0.036 | \*\* | 0.037 | \*\* | 0.036 | \*\* | 0.036 | \*\* | 0.036 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  |
| Technology use | 0.020 | \* | 0.021 | \* | 0.020 | \* | 0.020 | \* | 0.018 | \* |
|  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  | (0.009) |  |
| Total employees | -0.001 |  | -0.000 |  | -0.001 |  | -0.001 |  | -0.001 |  |
|  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  |
| Business equipment | -0.003 |  | -0.002 |  | -0.003 |  | -0.003 |  | -0.003 |  |
|  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  |
| Business plan | 0.004 |  | 0.005 |  | 0.005 |  | 0.003 |  | 0.004 |  |
|  | (0.012) |  | (0.012) |  | (0.012) |  | (0.012) |  | (0.012) |  |
| Technology less phone | -0.033 | \*\* | -0.032 | \*\* | -0.033 | \*\* | -0.034 | \*\* | -0.033 | \*\* |
|  | (0.010) |  | (0.010) |  | (0.010) |  | (0.010) |  | (0.010) |  |
| Business network | 0.058 | \*\* | 0.059 | \*\* | 0.059 | \*\* | 0.058 | \*\* | 0.058 | \*\* |
|  | (0.016) |  | (0.016) |  | (0.016) |  | (0.016) |  | (0.016) |  |
| Internet access | 0.036 |  | 0.038 |  | 0.036 |  | 0.033 |  | 0.036 |  |
|  | (0.022) |  | (0.022) |  | (0.022) |  | (0.022) |  | (0.022) |  |
| Keep financial records | 0.007 |  | 0.008 |  | 0.008 |  | 0.007 |  | 0.007 |  |
|  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  |
| Credit Access |  |  | -0.011 |  |  |  |  |  |  |  |
|  |  |  | (0.007) |  |  |  |  |  |  |  |
| Savings |  |  |  |  | -0.002 |  |  |  |  |  |
|  |  |  |  |  | (0.007) |  |  |  |  |  |
| Insurance |  |  |  |  |  |  | 0.022 |  |  |  |
|  |  |  |  |  |  |  | (0.013) |  |  |  |
| Banking |  |  |  |  |  |  |  |  | 0.011 |  |
|  |  |  |  |  |  |  |  |  | (0.009) |  |
| Intercept | 0.073 | \*\* | 0.076 | \*\* | 0.075 | \*\* | 0.074 | \*\* | 0.068 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  | (0.010) |  |
| Number of observations | 2666 |  | 2666 |  | 2666 |  | 2666 |  | 2666 |  |
| \*\* p<.01, \* p<.05 | | | | | | | | | | |

**Appendix 8. Tobit Regression Model Results**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PE scores vs overall FSU services | | PE scores vs overall Credit | | PE scores vs overall Savings | | PE scores vs overall Insurance | | PE scores vs overall Banking | |
| Financial services (FSU, Credit, Savings, Insurance, and Banking) | 0.004 |  | -0.011 |  | -0.002 |  | 0.022 |  | 0.011 |  |
|  | (0.006) |  | (0.007) |  | (0.007) |  | (0.013) |  | (0.009) |  |
| SMED helped | 0.100 | \*\* | 0.101 | \*\* | 0.101 | \*\* | 0.100 | \*\* | 0.100 | \*\* |
|  | (0.035) |  | (0.035) |  | (0.035) |  | (0.035) |  | (0.035) |  |
| Business years | 0.001 | \*\* | 0.001 | \*\* | 0.001 | \*\* | 0.002 | \*\* | 0.001 | \*\* |
|  | (0.000) |  | (0.000) |  | (0.000) |  | (0.000) |  | (0.000) |  |
| Business registration | 0.042 | \*\* | 0.043 | \*\* | 0.043 | \*\* | 0.039 | \*\* | 0.042 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.010) |  | (0.009) |  |
| Electricity | -0.003 |  | -0.004 |  | -0.004 |  | -0.003 |  | -0.004 |  |
|  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  |
| Piped water access | 0.036 | \*\* | 0.037 | \*\* | 0.036 | \*\* | 0.036 | \*\* | 0.036 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  |
| Technology use | 0.020 | \* | 0.021 | \* | 0.020 | \* | 0.020 | \* | 0.018 | \* |
|  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  | (0.009) |  |
| Total employees | -0.001 |  | -0.000 |  | -0.000 |  | -0.001 |  | -0.001 |  |
|  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  |
| Business equipment | -0.003 |  | -0.002 |  | -0.003 |  | -0.003 |  | -0.003 |  |
|  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  | (0.008) |  |
| Business plan | 0.004 |  | 0.005 |  | 0.005 |  | 0.003 |  | 0.004 |  |
|  | (0.012) |  | (0.012) |  | (0.012) |  | (0.012) |  | (0.012) |  |
| Technology less phone | -0.033 | \*\* | -0.032 | \*\* | -0.033 | \*\* | -0.034 | \*\* | -0.033 | \*\* |
|  | (0.010) |  | (0.010) |  | (0.010) |  | (0.010) |  | (0.010) |  |
| Business network | 0.058 | \*\* | 0.059 | \*\* | 0.058 | \*\* | 0.058 | \*\* | 0.058 | \*\* |
|  | (0.016) |  | (0.016) |  | (0.016) |  | (0.016) |  | (0.016) |  |
| Internet access | 0.036 |  | 0.037 |  | 0.036 |  | 0.033 |  | 0.036 |  |
|  | (0.022) |  | (0.022) |  | (0.022) |  | (0.022) |  | (0.022) |  |
| Keep financial records | 0.007 |  | 0.008 |  | 0.008 |  | 0.007 |  | 0.007 |  |
|  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  | (0.007) |  |
| Credit Access |  |  | -0.011 |  |  |  |  |  |  |  |
|  |  |  | (0.007) |  |  |  |  |  |  |  |
| Savings |  |  |  |  | -0.002 |  |  |  |  |  |
|  |  |  |  |  | (0.007) |  |  |  |  |  |
| Insurance |  |  |  |  |  |  | 0.022 |  |  |  |
|  |  |  |  |  |  |  | (0.013) |  |  |  |
| Banking |  |  |  |  |  |  |  |  | 0.011 |  |
|  |  |  |  |  |  |  |  |  | (0.009) |  |
| Intercept | 0.073 | \*\* | 0.076 | \*\* | 0.075 | \*\* | 0.074 | \*\* | 0.068 | \*\* |
|  | (0.009) |  | (0.009) |  | (0.009) |  | (0.009) |  | (0.010) |  |
| var(e.eff\_G\_1) | 0.025 |  | 0.025 |  | 0.025 |  | 0.025 |  | 0.025 |  |
|  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  | (0.001) |  |
| Number of observations | 2666 |  | 2666 |  | 2666 |  | 2666 |  | 2666 |  |
| \*\* p<.01, \* p<.05 | | | | | | | | | | |