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Access to credit for rice farmers and its impact on productivity: the case of Ebonyi State, Nigeria

This study examines the impact of access to bank and non-bank credit on rice productivity and output. It employed the coarsened exact matching (CEM) model and qualitative methods for primary data on a purposive sample of 450 rice farmers across three Local Government Areas of Ebonyi State, Nigeria. Pre-matching results suggest that access to non-bank credit and access to total credit significantly affected labour productivity and output, while access to bank credit significantly affected output. However, the post-matching results show that access to all three categories of credit has no significant effect on either output or capital, labour, and total factor productivity. This study therefore recommends that for an improved production and productivity yield among rice farmers in the state, policies should focus on the issues of improved quality of education and constraints in accessing loans/credits.

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Introduction

Nigeria has long been classified as a mono-product economy as revenue from oil dictates the fate of the economy. This dependence became so high that in 2006, revenue from oil accounted for over 87% of the total federal government revenue and the just witnessed economic recession in the country was attributed to the decline in the international oil price. Given the danger of this oil dependency, efforts have recently been made to improve the diversification of the economy with a focus on the agricultural sector at both the national and state levels.

Ebonyi State is reckoned to be one of the most agrarian of all the states in Nigeria. The state comprises both savannah and semi-tropical vegetation, has humid, sandy, and marshy soil, and is blessed with moist land that is suitable for farming a variety of cash and food crops. In view of its agricultural potential, it stands out as one of the states with the greatest production of rice. Ebonyi State is geographically well endowed for rice production, yet it is still producing far below its capacity. This is unfortunate given that Nigeria is still ranked the second largest importer of rice in the world and the highest in Africa with over 3,000,000 tonnes imported annually. Rice consumption in Nigeria is at the yearly rate of 24.5 kg per citizen, which shows that the current annual production level of 3.5 million tonnes is insufficient. However, the federal government has enacted homegrown agricultural production policies with one of the essential crops being rice. With the ban on importation of rice at the national and Ebonyi State levels, homegrown rice production is now expected to rise to meet the excess demand. It is therefore imperative for rice farmers in Nigeria and Ebonyi State in particular to take advantage of this business opportunity by commercialising their products for value addition. As is the case with most agrarian societies in Nigeria, crop production faces severe challenges ranging from low start-up capital, inadequate access to credit, inadequate infrastructure, poor mechanised systems, low technical know-how, non-affordability of high breed seeds and pesticides, low levels of investor interest in the sector, traditional subsistence practices and current changes in the weather among others (Ume *et al.,* 2016). Therefore, this study examines the extent to which access to bank and non-bank credit improved the output as well as the labour, capital and total productivity of rice farmers, using a coarsened exact matching model and qualitative methods for primary data on a purposive sample of 450 rice farmers across three Local Government Areas of Ebonyi State.

The objective is motivated by the fact that in 2015, the Central Bank of Nigeria ranked Ebonyi State highest among states in the country where individuals had no access to finance, with about 56% of its entire population having no access to financial services including owning of bank accounts (Okutu, 2015). This is a call for concern as Yuni (2017) posits that credit is the most influential means of expanding existing agro-based small and medium enterprises (SMEs) or creating new ones as it is the most elastic of the financial sources available to agro-based SMEs in Nigeria. Moreover, according to the International Investment Bank, improving financial markets helps to secure wider government objectives on investment and growth in the economy, and it has now widely been recognised how vital growth is to smaller businesses (Goldman Sachs International 2015).

Several works have analysed the relationship between credit access and production in Nigeria. Most of these works analysed these relationships at national, regional, and state levels, including Olagunju and Babatunde (2011) and Ojo *et*

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al. (2019) for South-West Region as well as Obilor (2013) for Nigeria. At the state level, Ettah and Kuye (2015) made similar analysis for Cross River State as well as Mgbebu and Achike (2017) and Ume *et al.* (2016) for Ebonyi State.

However, literature that ascertains this relationship for Ebonyi State which is one of the most agrarian of all the states in Nigeria and rice production in particular is scanty. It is therefore on this premise that this study examines the extent to which, access to bank and non-bank credit improved on output as well as labour, capital and total productivity of rice farmers using the coarsened exact matching model and qualitative methods for primary data on a purposive sample of 450 rice farmers across three Local Government Areas of Ebonyi State.

The rest of this paper is organised as follows: Section 2 reviews relevant literature on access to credit and output/ productivity relations. Section 3 presents the methodology, Section 4 demonstrates and discusses the empirical results, while Section 5 concludes with some policy recommendations.

Literature Review

The theory of marginal productivity updates the theory of the factors of production. The most comprehensive description of this theory is by J. B. Clark. Marginal productivity of labour and of capital could be defined as the additional output obtained by increasing the input (labour and capital) by one unit, respectively. The theory of marginal productivity proposes that the value of a product is created by the three basic factors of production (labour, capital, and land, wherein land represents all other natural resources used in production) (Clark, 1899). There exist two major conclusions that can be drawn from the theory of marginal productivity. The first refers to the concept of "perfect competition" which refers to a point, where per unit of input is best employed, or, in other words, the most efficient utilisation of productive resources. The second conclusion, which deals with the distribution of created value, claimed that the income earned by each factor is proportional to the quantity and value of its marginal product. This theory and others such as knowledge worker productivity (KWP) by Drucker (1993), quality theory by Waugh (1928) and the agricultural productivity gap theory (Gollin *et al.,* 2011) show that productivity is a better concept to assess output than just production. This study employs labour, capital, and total factor productivity to determine different productivity measures, especially given that factor products have altering intensities for production.

The empirical literature features papers examining the effect of credit access on different outcome indicators, or else measuring other tools or influences on productivity. In examining credit impact from a macro perspective, Imoisi *et al.* (2012) provide evidence that commercial bank loans have contributed significantly to agricultural output. They examined credit facilities and agricultural output and productivity in Nigeria from 1970-2010. Their results showed that there was a significant relationship between Deposit Money Banks loans and advances and agricultural output. However,

credit facilities provided by these financial institutions to the agricultural sector were shown to be inadequate and to have affected the level of output provided by the agricultural sector. Similarly, Adetiloye (2012) examined the provision of credit to the agricultural sector as an assessment of the Agricultural Credit Guarantee Scheme Fund (ACGSF) in Nigeria. The results show that although credit to the agricultural sector is significant, it has not been growing relative to the economy. While Obilor (2013) used an error correction model to show that commercial banks' credit to agricultural sector for the period 1984 to 2007 had no significant positive impact on agricultural productivity in Nigeria, the ACGS loan has intentionally led to significant growth in agricultural productivity in Nigeria.

On the other hand, cross-sectional works or micro-analysis on the subject are abound. Micro-analysis is critical in observing this relationship because cross-sectional units, farms or firms offer variables that may not be readily available at the macro level. Fakayode *et al.* (2009) performed an empirical economic analysis of the on-lending loan scheme of the Agricultural Credit Agency of Ekiti State (ESACA), Nigeria. They used descriptive statistics to show that the resultant gross margin from cropping activities of loan beneficiaries was low. However, this was higher than that of non-beneficiaries because the beneficiaries were engaged in diversified crops, including a mix of food and cash crops. Similarly, Isa (2009) shows that 17% of rural women sourced credit from formal sources (commercial banks/ agricultural banks), while 83% got theirs from informal sources like friends, relatives, NGOs, and personal savings. Women encountered problems like inaccessibility of credit institution, lack of collateral security or administrative bureaucracy in accessing formal sources of credit. Problems such as high-interest rate also posed challenges in accessing informal sources of credit. The cross-tabulation/chi-square analysis showed that occupation, education, and land ownership influenced access to agricultural credit. Socio-economic factors like age, family size, farm size did not influence access to credit. Finally, the chi-square analysis proved that there was a significant relationship between the amount accessed and level of output. Women who received a high amount of credit experienced an increase in their agricultural output.

Olagunju (2011) investigated the impact of credit on poultry productivity in Ogun, Osun, and Oyo States of Southwest Nigeria. The study employed logit and multiple regression models and showed that amount of credit had a significant direct relationship with poultry productivity. Still, in the Southwest, Bolarinwa and Fakoya (2011) compared the agricultural output recorded by credit beneficiaries and non-credit beneficiaries in Nigeria. The findings from the study show inadequate provision of credit from formal credit institutions with about 40% of beneficiaries securing loan from formal credit institutions, and 60% from informal credit institutions. Beneficiaries recorded higher (80,000 tons) cocoa production compared to lower (21,000 tons) cocoa production recorded by non-credit beneficiaries. There was a positive and significant correlation between the performance of farm production operations and securing of credit for crops production level (r= 0.382). In a similar vein, Oyeyinka and Bolarinwa (2009) examined the use of

Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB) smallholder direct loan scheme to increase agricultural productivity in the rural areas of Oyo State, Nigeria. Systematic random sampling technique was used to select 130 beneficiaries and 130 non-beneficiaries for the study. The results of the study showed that the beneficiary's access to credit had enabled them to make efficient use of improved farm inputs and labour than non-beneficiaries. It could be deduced that the NACRDB smallholder direct loan scheme was capable of transforming rural agriculture.

Three empirical works in the literature are closest to the interest of this study. First, Ume *et al.* (2016) measured the level of technical efficiency and the determining factors among a sample of 120 rice farmers in Ezza South Local Government Area of Ebonyi State, Nigeria. The determinants of technical efficiency in rice production in the study area were farming experience and household size. The limiting factors to rice production in the study area were the high cost of improved inputs, inadequate access to credit, poor access to information and problem of diseases and pests. Second, Ettah and Kuye (2015) examined the socio-economic characteristics and factors affecting the output of credit beneficiaries using a sample of 108 rice farmers in Yakurr Local Government Area of Cross River State, Nigeria. The results show that farm size, income and household size positively affected the output of farmers at various levels of probability, while age negatively affected the output of farmers. Third, Mgbebu and Achike (2017) investigated the determinants of successful loan acquisition from formal financial institutions by a sample of 120 small-scale rice farmers, and the multiple regression results indicated that farm size, cost of farm inputs and interest charge were significant in determining loan acquisition.

Ettah and Kuye (2015) as well as Mgbebu and Achike (2017) examined the determinants of credit access, while Ume *et al.* (2016) showed that credit access was a weak determinant of the technical efficiency of rice production in Ebonyi State. Nevertheless, it is not enough to establish the determinants of credit access, as it is also essential to underscore to what extent the credit accessed impacts on output and productivity. This study is justified by the fact that Ebonyi State is one of the youngest states created in the Nigerian Federation and is reckoned as one of the most agrarian of all the states with great potential for rice production but ranked as the highest state without access to financial services according to the Central Bank of Nigeria (CBN). This study, therefore, employs a larger sample size of 450 small-scale farmers to ascertain the impact of access to credit from bank and non-bank financial institutions on rice output and productivity.

Methodology

Data and Descriptive Statistics

The study employed primary microdata for 450 small-scale farmers sourced from three Local Government Areas (LGAs) of Ebonyi State; Abakaliki, Ikwo and Afikpo North.

Purposive sampling was employed to survey only rice farmers in the concerned LGAs. Research assistants who understood the language of the people of the LGAs administered the questionnaires and recorded the responses. The study employed the Fisher's population proportion formula to estimate the sample size as follows:

$$\text{Sample size: } n = \frac{z^2 \alpha \beta}{\varepsilon^2} = \frac{(1.96)^2(0.5)(0.5)}{0.00216225} = \frac{0.9604}{0.00216225} = 444.17 \quad (1)$$

where α is the proportion in the target population estimated to have a particular characteristic (the study approximates 50%); β is the complement of α which is $(1 - \alpha)$; ε is the margin of error (consider an error margin of 4.65% - arbitrarily determined to be less than 5%), and z is the confidence level expressed in standard deviation usually set at (95% or 1.96).

The study was carried out in November 2019 and considered three Local Government Areas in Ebonyi State with a sample of 450 farmers. There exists no statistics for the actual number of rice farmers in the three LGAs selected but all three are perceived to have similar number of rice farmers. Hence, 150 questionnaires were administered equally for each LGA. Of the 450 instruments collected, 2 were outliers especially on the amount of output, and so the study employed 448 respondents (still higher than the computed 444.17 above). The study observed all the ethics of field survey research, and the validity and reliability tests were confirmed as appropriate.

The descriptive statistics of the key quantitative variables employed by the study are presented in Table 1, which is classified into three strata: the whole sample, a sample of those who accessed credit only and those who did not. The means and standard deviations are similar across all three strata, although it is worth noting that average output, age, and distance to the closest financial institution are marginally higher for farmers that accessed credit than those who did not.

Table 1: Descriptive statistics of key quantitative variables.

Variables	All farmers	Farmers with credit access	Farmers without credit access
Output (sales)	62,727.7 (51,517.9)	67,539.3 (56,949.9)	55,629.83 (41,390)
Age	46.07 (7.7)	46.2 (7.7)	45.8 (7.97)
Experience	19.71 (8.8)	18.15 (8.35)	22 (95)
Distance to closest bank/FI	23.2 (25.9)	23.2 (27.7)	23.06 (23.14)
Capital Productivity	1.31 (1.09)	1.3 (1.32)	1.31 (0.61)
Labour Productivity	15,058.2 (11,600.6)	13,336.61 (10,947.6)	17,597.9 (12,091.4)
Total factor productivity	4.35 (3.63)	4.34 (4.39)	4.37 (2.03)

Note: Standard deviations are in parenthesis.
Source: Authors' computations based on data from survey 2019

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Table 2: Descriptive statistics of key categorical variables.

Proportion of observations	All farmers	Farmers with credit access	Farmers without credit access
Credit	59.6		
Credit from bank/ Financial institution	16.52		
Non-bank credit (Esusu and cooperative)	50.2		
Sex (male = 1)	64.5	76.14	47.51
Land ownership (own land = 1)	41.29	46.4	33.7
Farmer has no education	0.2	0.23	0.2
Farmer completed primary school	0.18	0.11	0.23
Farmer completed secondary school	0.35	0.31	0.3
Farmer completed tertiary school	0.13	0.18	0.18
Farmer completed postgraduate education	0.13	0.17	0.06

Source: Authors' computations based on data from survey 2019

It is also worth noting from Table 2 that the proportion that received credit from banks or financial institutions (16.52) is about a third of those who received credit from non-financial institutions (50.2). In addition, the proportion of males and the proportion that own land are higher for those who accessed any credit than those who did not access credit.

Methods

The study employed both quantitative and qualitative methods for its analysis which was conducted using the STATA 16 econometric software. Specifically, the study employed the coarsened exact matching (CEM) model to ascertain its objective of examining the impact of access to bank and non-bank credit on rice productivity and output. The CEM methodology is a monotonic imbalance reducing matching method, that is said to mimic a randomised treatment assignment that produces 'Treatment' and 'Control' groups after the treatment has been administered (Blackwell *et al.,* 2009; Guarcello *et al.,* 2017). CEM reduces covariate imbalances for the subsequent determination of a treatment effect by matching samples of strata with exact/same signature – hence the exact matching. It is preferred to other matching methods such as the popular Propensity Score Matching (PSM) model in that it processes more efficiently and reduces model dependence, variance and bias that may apply in contemporary research (Guarcello *et al.,* 2017). The goal in CEM is to ascertain the average treatment effect on the treated (ATT).

The CEM algorithm could be classified into three key steps, as proposed by Iacus *et al.* (2012); Green *et al.* (2015) and Zhao *et al.* (2021). First, one should coarsen each control variable with the purpose of matching. Secondly, the coarsened data should be sorted and matched by the algorithm of exact matching, while the unmatched units should

be discarded. Thirdly, the coarsened data should be removed and the un-coarsened values of the matched data retained in such a way that does not include at least one treated and one control unit. Following these steps, a weighting variable is automatically generated by the CEM method to equalise the number of observations within comparison groups. Also, the imbalance measure denoted as L_1 is used to check the balancing of two comparative groups; its value usually ranges between 0 and 1.

To compute the L_1 statistic, we start by coarsening the covariates into bins, after which we cross-tabulate the control variables for the treated and control groups separately. We then record the k-dimensional relative frequencies for the treated $f_{l_1.....l_k}$ and control $g_{l_1.....l_k}$ units (Blackwell *et al.,* 2009). The measure of imbalance is the absolute difference over all the cell values.

$$L_1 = (f, g) = \frac{1}{2} \sum_{l_1.....l_k} | f_{l_1.....l_k} - g_{l_1.....l_k} | \qquad (2)$$

where the boundaries of 0 implies perfect global balance and 1 means perfect global imbalance. If L_1 is very low or close to zero, it depicts a good matching and if L_1 is closer to 1, then it does not show good matching.

This study employs three sets of treatment and control groups which are: access to total credit (assigned as 1 if respondent had access to any form of credit and zero otherwise), access to bank credit (assigned as 1 if respondent had access to only bank credit and zero otherwise) and access to non-bank credit (assigned as 1 if respondent had access to non-bank credit and zero otherwise). Access to any of these credit categories is dependent on the following control variables that will be employed in the model: education levels, age, experience in years, land ownership (own land = 1, 0 otherwise) and sex (1 if male, 0 otherwise). Meanwhile, the outcome variables used are output sales, labour productivity, capital productivity and total factor productivity.

In line with the literature, labour productivity is given as output (sales) divided by labour, while capital productivity is output divided by capital. The study also employs total factor productivity in an effort to examine labour and capital productivity jointly. Total factor productivity is calculated by dividing output by the weighted average of labour and capital inputs. There exist several conceptualisations of the measure of total factor productivity; however, this study adopted the approach of Nadiri (1970), according to whom the total factor productivity index is given as:

$$A = Y | (aL + bK) \qquad (3)$$

where A is total factor productivity, Y is the firm's output, L is labour, K is capital while a and b are some appropriate weights for labour and capital, respectively. The standard weighting for labour and capital are 0.7 for labour and 0.3 for capital (Gordon, 2016). TFP is often regarded as the real driver of growth within an economy and studies reveal that while labour and investment are important contributors, TFP could account for up to 60% of growth in an economy (Easterly and Levine, 2001).

Table 3: Number of observations Pre- and Post-Matching.

Description	Credit		Bank Credit		Non-bank Credit	
	Control	Treatment	Control	Treatment	Control	Treatment
All	181	267	374	74	223	225
Matched	89	131	64	47	113	151
Unmatched	92	136	310	27	110	74

Source: Authors' estimations based on data from survey 2019

Table 4: Results of the Imbalance Measure and the Coarsened Exact Matching Estimation.

Description	Pre-Matching			Post Matching		
	Credit	Bank Credit	Non-bank Credit	Credit	Bank Credit	Non-bank Credit
Overall	0.6866	0.8421	0.6471	0.0618	0.0872	0.1839
Age	0.1926 (0.4295)	0.1518 (1.6600)	0.1648 (0.4592)	0.0458 (-0.3026)	0.0426 (0.0234)	0.0868 (-0.2456)
Education level	0.2909 (0.6092)	0.5435 (1.7888)	0.1980 (-0.0269)	1.7e-16 (0.0000)	3.3e-16 (-2.2e-15)	4.2e-16 (8.9e-16)
Sex	0.2897 (0.2897)	0.2395 (0.2395)	0.2170 (0.2170)	9.7e-17 (-1.1e-16)	6.2e-17 (1.1e-16)	5.6e-17 (0.0000)
Experience	0.2701 (-3.8557)	0.1539 (-1.2685)	0.2538 (-2.6894)	0.0008 (-0.1948)	0.0234 (0.0213)	0.0530 (-0.2270)
Land ownership	0.2383 (0.2383)	0.6328 (0.6328)	0.0367 (0.0367)	8.3e-17 (-1.7e-16)	2.6e-16 (-4.4e-16)	3.6e-16 (2.8e-16)

Note: Table 4 contains L_1 values while mean values are in parenthesis.
Source: Authors' estimations based on data from survey 2019

Table 5: Causal Effect Estimation of Credit Access on Output and Productivity.

Description	Pre-Matching			Post Matching		
	Credit	Bank Credit	Non-bank Credit	Credit	Bank Credit	Non-bank Credit
Labour Productivity	-4,261 (0.000)***	439 (0.7660)	-3,587 (0.0010)***	441 (0.7250)	676,057 (0.8060)	619 (0.6400)
Capital Productivity	-.01076 (0.9180)	0.0932 (0.5010)	0.0189 (0.8550)	0.0088 (0.9230)	0.0276 (0.9450)	0.0425 (0.7980)
Total Factor Productivity	-.03611 (0.9180)	0.3108 (0.5010)	0.0627 (0.8550)	0.0296 (0.9220)	0.0921 (0.9450)	0.1419 (0.7980)
Output Sales	11,909 (0.0160)**	10,718 (0.0970)*	15,601 (0.0010)***	5,644 (0.4660)	-8,504 (0.5300)	7,614 (0.3010)

Note: Probability values are in Parenthesis. *** means significant at 1%; ** for 5% and * for 10%.
Source: Authors' estimations based on data from survey 2019

Results and Discussion

To achieve the objective of this study, the study employed the CEM methodology specified above. The matching methodology is known for reducing the observations employed in the regression due to its ability to retain only exactly matched strata. Table 3 below shows the number of observations for the control and treatment groups pre- and post-matching. The number of observations matched remain fairly reasonable, especially considering its proportion to the treatment group, which is smaller in all 3 categories of credit access. Although there may be a reduction in the number of observations, which is to be expected, the efficiency of the estimates is well recognised in the literature (Blackwell *et al.,* 2009; Iacus *et al.,* 2012).

Table 4 shows the results of the imbalance measure and the coarsened exact matching estimation. The post matching results show much-balanced results than the pre-matched

results, given that the overall imbalance statistical measure -L_1 of the post-matching results for all 3 categories of credit access is less than 0.2, while those for pre-matching are all greater than 0.6. The imbalance measure, L_1, also reduced after matching for the individual control variables when compared to the values before matching. Therefore, we conclude that there exists minimal imbalance with respect to the full joint distribution, with a record of perfect global balance in two instances.

The means (in parenthesis) of the post matching results are very small, which show that there exists a marginal difference across the control variables between farmers who access any of the three categories of credit and those who do not. This shows that the socio-economic characteristics of the farmers differ very slightly (as no mean of the post-matched estimates is greater than 1) between the treatment and control groups. This is not surprising as the exact matching algorithm ensures that the matched sample are as close as possible.

Finally, to estimate the causal effect of credit access on the different types of productivity employed as well as output sales, the study incorporated the CEM-weights in the regression estimation of credit access on output. The causal effect ascertains the ATT for the 3 credit categories across the four outcome variables. Table 5 therefore shows the results of the regression of credit access on the outcome variables before and after matching.

The results show that, prior to matching, access to non-bank credit and access to total credit significantly affected labour productivity and output sales at 5% significant level, while access to bank credit significantly affected output sales at 10% significant level. Meanwhile, the post matching results show that access to credit, bank credit or non-bank credit has no significant effect on labour productivity and output. Similarly, access to the three categories of credit has no significant effect on capital productivity and total factor productivity pre and post matching.

The results therefore imply that, though there is some level of significance on how credit affects labour productivity and output before matching, in the main post matching results, none of the credit access significantly affects any of the categories of productivity and output at 5% significant level. This may be surprising but shows the quality and quantity of credit offered to rice farmers in Ebonyi state of Nigeria. Despite the huge potential of rice production in the state, there exists no significant causal effect of any category of credit on output sales in general or productivity.

The literature suggests the following as reasons for which bank credit may not have a significant effect on output or productivity: banks and other financial institutions are usually biased in favour of large-scale farmers only, requests are made for collateral which farmers cannot provide, they levy high interest rates, loans are available only for account holders and there may also be a bias against agricultural enterprises like rice farmers that do not bring in quick returns to repay the loan: this may further disadvantage poorly educated farmers who lack technical know-how in cutting-edge farm techniques amongst other things (Samson and Obademi, 2018; Antunes *et al.,* 2015).

Though these may explain the lack of access to credit from banks and other financial institutions, non-financial institutions face similar challenges. For example, due to the lack of sustainability of these sources (family, friends, local contribution schemes, cooperatives, etc.), they have a limited time frame for loan repayment which may be shorter or inadequate for the full rice production gestation period, hence may not have the necessary impact that is expected. In addition, the amount of credit is usually small and inadequate to meet the needs of farmers. This explains why there may be three times more farmers accessing credit from non-financial sources and yet it has no significant causality on output or productivity.

The results tend to contradict several studies, including Olagunju (2011), Bolarinwa and Fakoya (2011), Imoisi *et al.* (2012) and Adetiloye (2012) and Oyeyinka and Bolarinwa (2009) who claimed to have established a significant effect of access to credit on output or production. These studies indeed agree with what was expected *a priori* as per the literature. Nevertheless, the findings of the current paper are in line with the findings of Ume *et al.* (2016) who showed that credit access was a weak determinant of the technical efficiency of rice production in Ebonyi State. Not only does this study go beyond mere output to consider capital, labour and total factor productivity, but it also uses an advanced methodology which compares the productivity of farmers with very similar or 'exact' socio-economic characteristics. The authors of this study therefore submit that, although credit access is meant to significantly improve output and indeed productivity, it does not achieve this outcome in the case of Ebonyi state for some of the possible reasons stated above.

Conclusions

This study examines the impact of access to bank and non-bank credit on rice productivity and output in three Local Government Areas of Ebonyi State, Nigeria. The study adopted the coarsened exact matching (CEM) model and qualitative methods to determine the extent to which access to bank and non-bank credit improve output as well as the capital, labour, and total productivity of rice farmers in the three local government areas of the state. Findings reveal that, while access to non-bank credit and access to total credit significantly affected labour productivity and output sales in the pre-matching, access to bank credit significantly affected output sales only. The post- matching results show that access to all three categories of credit has no significant impact on output and productivity.

The implication of the results therefore is that the level of access to credit among rice farmers in the state is still very low despite the huge credit facilities domicile within the banking sector and the huge potential of rice production. Some of the reasons behind the poor access to credit facilities among the rice farmers are the level of education of all categories of farmers and constraints in accessing credits. Available statistics show that while the greater percentage of rice farmers in the state falls within the 'no education' and 'primary school' categories, constraints on accessing credits are high. This study therefore recommends that for an improved production and productivity yield among rice farmers in the state, a policy thrust that takes into consideration the issues of improved quality of education and constraints in accessing loans/credits are desirable. Policymakers within the state and non-state actors who are interested in promoting rice production and productivity need to engage in aggressive advocacy programmes that enlighten farmers on ways and means of participating in government programmes with a view to accessing the huge funds domicile within the banking sector, most especially within the Central Bank of Nigeria (CBN). At present, many farmers within the state are unaware of the several programmes initiated by the current administration since 2015 with the aim of strengthening agricultural production in the country. One of such programmes is the current CBN anchor-borrowers programme (ABP) for all categories of farmers in the country. The ABP is a non-interest scheme designed to boost agricultural yields, halt large food importation, and address the country's negative trade balance, however, very little is known of the programme among the farmers. Also, the state government needs to encourage the institutions to reduce conditions attached for the assessment of loans/credits by farmers. These will not only encourage more

farmers to access loans, but they will also improve outputs, productivity and will lead to inclusive growth.

Further studies could investigate the detailed reasons for access to credit not having a significant effect on production/productivity, which will be different from just investigating reasons for not accessing credit. It is therefore imperative to note that access to credit alone is not sufficient to impact on agricultural productivity and so, attention must be paid to the volume, nature and conditions of the credit received for it to realise its objective of increasing agricultural productivity.

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