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# Impact of international donor organizations' intervention on agricultural banking in Africa: Micro analyses

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The major part of African countries population lives in the rural areas and agriculture is the main source of such dwellers' livelihood. Access to agricultural credit is a milestone in the context of rural development of these countries. International donor organizations give some banks impetus to direct their loans to agricultural sector. This study tries to make motion about analyzing micro consequences of international donors' intervention in a number of banks of observed African states in terms of agricultural loan volumes. In particular, it analyzed selected banks that provide agricultural loans. Donors were related with some banks as they were providing relevant resources that banks were using for financing agricultural loans within the specific projects with them. Such banks were identified and those with no relevant nexus with donors; also their agricultural loan portfolios were compared and how they changed over time. Statistical analyses showed whether donors' role was significant in issuing agricultural loans or other factors were more important. Bank level analyses try to answer the following research question: do international donor organizations' loans and grants to banks increase supply of agricultural credit from banks? Selected bank specific variables were used for empirical analyses. Results show that international donor organizations have positive impact on African banks' agricultural lending volume. It can be also stated that both in donor related and non related banks deposits play important role in the issue of agricultural loans, while interest rate on agricultural lending stay insignificant in both cases.

**Key words:** International donor organizations, agricultural banking, agricultural lending.

## INTRODUCTION

As Duong and Izumida (2002) state agricultural credit is expected to play a crucial role in agricultural development. Farmers need access to financial resources for enhancing his capabilities. Igben (1987) states that great majority of farmers depend on "external" financial sources for executing their business activities. Furthermore

Jessop et al. (2012) state that access to finance is crucial for farmers, remaining without it makes farmers to stay in low-investment and low-productivity agricultural operations.

Islam (2011) states that recently there were much debates regarding the reasons of the plummeted growth

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of agricultural production, especially in the context of the world food crisis, which seriously hit developing countries in 2007 and 2008. The decrease in agricultural investment, as well as a decline in the share of the agricultural sector in the aggregate investment, was regarded to be a major stipulating factor to this crisis. Two components of investment in agriculture have gained particular attention as being of vital importance in this context. One refers to the trend in foreign aid to agriculture, and the other - trend in domestic public expenditure on agriculture. In this paper, the focus is on the former one – various types of foreign aid and its implications on agricultural finance.

Ayoola and Oboh (2000) mention that availability of sufficient capital is vital for each segment of agricultural production. Capital determines access to all other relevant resources on which farmers depend. According to Nwagbo et al. (1989) there is evidence that well applied farm credit stimulates capital formation and agricultural diversification, enhances productivity of resources, enlarges farm operations, fosters innovations, increases marketing efficiency, incomes and value added.

Access to financial services in rural areas of developing countries continues to be a vexing problem and the debate still rages of what would be the best institutional format for improving access. Pervaiz et al. (2011) emphasize credit availability issue and state that for developing agricultural productivity credit availability has great importance.

In Africa agricultural sector has vital importance as it is the major mean for poverty reduction. International donor organizations give some banks impetus to direct their loans to the agricultural sector. Matsumoto-Izadifar (2008) mentions that access to credit is one of the important areas where donors intervene and provide assistance.

Access to credit is an important issue that is also mentioned in Geihler (2004) who states that provision of small farmers' access to credits has been salient political agenda for numerous countries. Agricultural lending issues have long been focus of attention for several governments and donors. Coming from 1950s, governments and donors have disbursed huge amounts of financial sources on agricultural credit programmes. However, in many countries such programmes have not shown good results; they almost failed. Due to the scarce performance of these programmes, an important shift in approaches to agricultural lending in developing countries has taken place that will be discussed further.

This study tries to make motion about analyzing micro consequences of international donors' intervention in a number of banks of observed African states in terms of agricultural loan volumes. Donors were related with some banks as they were providing relevant resources that banks were using for financing agricultural loans within the specific projects with them. Statistical analyses will show whether donors' role was significant in issuing

agricultural loans or other factors were more important.

## LITERATURE REVIEW

The literature review is divided into two parts. The first part refers to the studies that investigate donor aid and its different consequences. The second part goes through the papers that are about agricultural banking, in particular agricultural lending and its determinants.

### Literature review on donors' aid

Obviously literature about foreign donors' aid refers to macroeconomic analyses. Most of studies focused on how they affected economic growth, employment and other country level macroeconomic aspects. There are plenty of such studies and analyses that provide empirical evidence about donor's importance and the consequences of their impact. Some studies study the effects of foreign aid on recipient countries, some investigate aid-allocation criteria, others - the determinants of foreign aid, in particular which donor gives to which country and why. The topic is interesting worldwide for several countries as such interventions play a role of catalyst in different areas of economy and social or other fields. In numbers: foreign aid from official sources to developing countries amounted to \$103.6 billion in 2006 and has amounted to over \$2.3 trillion over the past 50 years. There have been strong debates on the effectiveness of this aid and how could it work in the future.

In the 60s and 70s which were years of post-colonial period, one way through which governments decided to facilitate access to finance in agriculture was to administratively determine interest rates. Governments also addressed the issue by setting compulsory quotas on lending for the banks. Development banks specializing on financing agriculture were also launched by the governments. Ministries of finance and central banks played intermediary role between international organizations providing special credit lines and the local banks who were getting that finances at preferential rates. These international organizations were World Bank, International Fund for Agricultural Development, African Development Bank, Asian Development Bank and etc. The difference between interest rates was covered by the government. Absolute majority of developing countries adopted the practice of creating development banks specialized in agriculture. While the strengths of such banks are quite moderate, its limitations seem to be significant. Of course, that process had its causes and preconditions.

As Klein et al. (1999) mention, the reason for the creation of many agricultural development banks was just political decision and not intended for sustainable

functioning. Because they were set up to direct subsidized money to farmers that was coming from governments and different donors, they were not following competitive market rules and inducements of commercial banks. According to Jessop et al. (2012) as agricultural development banks were providing finances only for agricultural sector, they had no possibility for diversification, hence violating one of the main principles for banks in the sphere of managing risk. Perception that repayment was not compulsory became prevalent due to the banks' links with the government. Another problem related to the period was that agricultural development banks gave loans according to supposed needs instead of actual demand. Due to the provision of subsidized agricultural credit through the state channels that entailed low levels of loan recovery, it created such circumstances where commercial banks were reluctant to operate in agricultural sector. As a result farmers became fully dependent on one or several finance providers that were state-subsidized.

With time, the situation was changed gradually, because of the past lessons and experiences from the early 1980s; attention moved to providing financial services to the poor in a cost-efficient and sustainable manner. Despite this was initially conceptualized by microfinance institutions that were NGO-type, soon governments, banks and international development organizations became involved.

Further, Jessop et al. (2012) argue that the practice of providing credit directly via state created agricultural development banks changed into support to commercial banks, microfinance institutions and NGOs creating and implementing agricultural finance that were considered as innovative.

As Nagarajan and Meyer (2005) states the new rural finance paradigm is based on the principle that a commercial, market-based approach will more possibly reach larger numbers of clients on a sustained basis. It is worth noting that donors have played a crucial role in supporting the evolution of rural finance paradigms. A number of donors have always included rural finance in their funding for rural and economic development agenda.

The new paradigm features is mentioned also in the paper of Klein et al. (1999), where authors state that considerable interest acquire the new approach of involving commercial banks. This approach was undertaken under the formation of new loan products and services for the borrowers with insufficient incomes. This is so called "down-scaling". Following this process bank should create special department inside it that will occupy relevant stuff. This approach is particularly attractive as well established financial institutions enjoy public confidence and this will play a big role in terms of the clients' outreach. This approach is more approved by the relevant authorities that is underlined in the IBRD (2003) where it is mentioned that this institution welcomes such financial systems approach for developing rural finance

that is based on the principle that institutions which are commercially viable will probably cover large numbers of clients on a continuous basis. Further, this argument is pointed out in Nagarajan and Meyer (2005) who argues that generally donors agree about the aspects that form rural financial institutions (RFIs) as prosperous ones. They assert that the approach should lie on developing RFIs that are self sustainable and are able to offer different loan products.

In the work of Feeny (2005), some evidences are shown about the positive impact of foreign aid on economic growth in Melanesian countries. Different from other papers regarding the impact of foreign aid that mostly focus on economic growth, this study investigates how foreign aid affects rural sector. Based on the findings of the report author suggests that higher proportion of foreign aid should be directed to the rural sector. Similar issue was studied by Alabi (2012) where he analyzed how foreign aid affects various sectors of Nigerian economy. In particular he paid attention on the impact of foreign aid on agricultural sector. He concludes that well planned aid management and coordination is needed for the prosperity of the Nigerian population. Kaya et al. (2008) found empirically that the relationship between growth in the agricultural output and agricultural aid for rural development is positive and statistically significant. Authors conclude that developmental aims of foreign aid can be obtained if it is targeted for the agricultural sector of the developing states.

More broad analyses were done by Loxley and Sackey (2008). They examined the effect of aid on growth in Africa. Authors found that aid has positive and statistically significant impact on growth in African states. Brückner (2013) in his paper first of all demonstrates that growth in per capita GDP of the developing country is linked with a considerable reduction in foreign assistance. Secondly author observed, that the negative reaction of foreign assistance to per capita GDP growth of aid recipient country deemed for that foreign assistance certainly had a statistically significant and positive impact on per capita GDP growth. Previously, Burnside and Dollar (2000) showed that aid has a positive effect on growth in developing countries which have good monetary, fiscal and trade policies but in case of poor policies such impact is moderate. Aid-growth linkage was analyzed also in the paper of Chowdhury and Das (2011). Authors' results illustrate that in four from five observed countries there is a positive long run relationship between growth rate of per capita real GDP and aid as a percentage of GDP. As a conclusion they mention that this analysis most likely contributes the aid effectiveness theory for South Asian states. Inanga and Mandah (2008), in their paper, find that in spite of difficulties to distinguish the impacts of foreign aid from other growth-stimulating elements, if foreign aid availed in an efficient and effective manner it can induce growth in a stable macroeconomic circumstances. Similar liaison was studied

by Gounder (2001) who found that gross foreign aid (including its different forms) has significantly affected Fiji's economic growth.

Contrary results were shown by Mallik (2008). He revealed the existence of long run relationship between per-capita real GDP, investment as a percentage of GDP, aid as a percentage of GDP and openness. Though, the long run impact of aid on growth is negative for the majority number observed countries. Previous author's arguments were strengthened by the paper of Tiwari (2011) who estimated the effectiveness of foreign assistance, foreign direct investment, and economic freedom for observed 28 Asian states. Also he found that aid had a negative impact on economic growth in these countries if the aid flows were high.

Jacobson and Abduraimjanov (2007) investigated how specific donors' partner banks in Kyrgyzstan adopted new product – micro agricultural loans. In this case the donors' assistance was carried out in two directions: provision of credit lines and giving technical assistance in the process of developing specific credit technologies. This is not an empirical paper but there is an evidence that overall development of agri-crediting was a success and each participating bank improved its own rates.

Support from international organizations can be expressed in various forms: direct subsidy, credit guarantee, credit line, aid from the budget and etc. International donor organizations have been promoting agricultural microfinances very actively that contributed to sustainability.

Moreover, Nagarajan and Meyer (2005) mentions that there are number of donors that put their efforts to make stronger rural finance with several tools at their possession, like grants, loans, some type of guarantees, and technical assistance.

Rodriguez and Santiso (2007), in their OECD discussion paper, mention that during the last couple of years it was confirmed a double convergence. International donors directed a high interest to the private sector. While, private banks have managed formation of sustainable lending and microfinance programs. As an outcome, we can see more dialogue between private banks and donors that itself visualize new areas for cooperation. Further, regarding the importance of donors Pearce (2003) mentions that donors are able to collaborate with governments as well as non government organizations, the private sector and different communities in order to create pertinent conditions for formal as well as informal financial institutions.

Donor intervention in general has played an important and positive role in strengthening and promoting financial system incorporating agricultural lending activities in several African countries such as in Sierra Leone as it is illustrated in the Sierra Leone Financial Sector Development Plan (2009). In the same report it is mentioned that one important feebleness of commercial banks there was scarce flow of finance to the rural and

agricultural sectors that was one of the subject of donors' intervention too. World Bank/ESW (2005) mentioned that promising areas where World Bank can intervene in order to promote rural finance are commercial banks seeking to expand their market, some state-owned agricultural and rural development banks that can be reformed or restructured, specialized rural microfinance institutions, cooperative financial institutions, and community-based financial organizations.

Jessop et al. (2012) mention that even after the shift in approach and making agricultural financial market liberalized, the shortage of agricultural credit remains a pending issue. In such circumstances, governments' and developing partners' role is vital towards achieving sustainable provision of finances.

The same issue is underlined in Lukwago (2010) where it is stated that the governments and donors witness the need to make credit more available to farmers. But it is also worth noting that as Meyer (2011) mentions creating sustainable financial institutions for serving the sector is complicated by difficult material, environmental and production characteristics of agriculture that hinders the demand for credit and insurance and their supply.

Now, let us switch to the studies related to donor interaction with financial intermediaries and the role of commercial banks. As seen above that in this scenario commercially viable and autonomous financial intermediaries are vital for sustainable development of agricultural finance, but here, the focus is on their role.

In the World Bank/ CGAP (2004) it is underlined that retail or micro-level financial institutions providing their services directly to customers still represent main pillar of financial systems. Needs of poor people are served by various financial and as well as non-financial institutions. For serving huge number of poor people and providing social returns in the long run financial sustainability is core issue. Long time ago donors started to support building individual microfinance institutions, especially microcredit organizations that have NGO status. They also support increased access to credit for specific target groups. Though retail financial institutions that potentially serve poor people do not only include NGOs but also include private as well as commercial banks owned by the state, credit and savings cooperatives, credit unions, member-owned community organizations, postal banks and various non-bank intermediaries (e.g. finance and insurance companies).

Seibel (2000), in the IFAD rural finance policy, mentions that for better accessibility to credit of the rural population, key role should play local intermediaries and banks should be able to bring the product to smallholders and micro entrepreneurs as an untapped market sector. In the World Bank/ESW (2005) it is underlined commercial banks' importance in the financial products provision; as in most states, commercial banks create the major part of the financial sector and offer various number of services that are unparalleled by any other institutional form. It is

more convenient to conduct through them the provision of financial services to small and medium enterprises (SMEs), including farm enterprises.

In the World Bank/ESW (2005) report is mentioned that reaching sustainable results is possible in the case when the interests of donors and governments coincide with those of commercial banks. It implies supporting commercial banks in achieving their goals. It can be done through the technical support and know-how in their expansion on rural markets or by supporting them in improving profitability of current rural financial services. Although donors and governments try to give incentives to commercial banks via special credit lines in order to provide finances for micro and small business, farmers and other target groups, it does not provide sustainable access for them to such finances. In the same report it is mentioned that many commercial banks have expressed their interests in entering new markets such as agribusiness and SME lending. In this scenario it is important that governments and donors provide support for interested banks that includes technical assistance and credit lines of special-purposes.

As Arosanyin (2003) mentions in spite of the considerable role of the informal financial operators that they are playing in the developing countries, the commercial banks' participation as providers of loans to the rural sector is essential. We can say that donors' assistance for particular banks has influence on their functioning and performance and is promoting financial expansion in terms of credits; it is theoretically clear but there is no empirical evidence that provides more deep analyses of bank by bank features of such intervention.

Thus as a concluding remark it can be underlined that there is a dearth of studies that analyze the impact of foreign donors' aid intervention on agricultural banking. This work will try to fill an empirical void between the relation of agricultural banking and donors' aid; it will analyze the impact of international donor organizations' intervention on the bank level, what is the impact of loans and grants of donors given to African banks on banks' agricultural lending portfolios that were never analyzed before. Additional clarification and assumptions are given further.

Donors' aid had quite noticeable attention from scholars but it was studied from other points of view rather than the one in this study.

Present work thus attempts to bridge this obvious gap in the literature. So it can be stated that the type of the research question going to be analyzed was not tested before.

### **Literature review on agricultural credit**

Most of the existing literature on provision of agricultural credit has focused mainly on lack of providers of rural financial services and the household demand for

agricultural loans with little attempt to explore banks' specific peculiarities that are determinants of agricultural credit supply. More attention was directed to demand side factors rather than supply side ones. In this part of this work, the present review of literature is about various topics related to agricultural lending on bank level.

The financial intermediaries having agricultural financial products and operating in the rural areas are several. In IFAD (2009) it is mentioned that in rural areas financial services are provided by commercial and development banks, non-bank financial institutions, cooperatives, microfinance institutions, savings and credit cooperatives, self-help groups, village savings and loan associations, financial service associations, input supply traders and agro processing companies.

Majority of literature about determinants of agricultural credit supply are more on household and farm side analyses. Many authors studied socio-economic and demographic factors that were influencing and significant factors for agricultural credit provision. One of such studies is done by Oboh and Ekpebu (2010) who analyzed how the credit allocation rates to the farm sector by arable crop farmers in observed State of Nigeria is influenced by socio-economic and demographic factors. Authors found that the most significant factors were: age, education, farm size, household size, length of loan delay and visitation by bank officials. Similar type of study was done by Kumar et al. (2010). Results demonstrate that the amount of institutional credit used by the farming households is influenced by a number of socio-demographic factors such as: education, farm size, family size, caste, gender, occupation of household, etc. Rahji and Adeoti (2010) tried to identify the factors affecting commercial banks' decision to ration agricultural credit in observed region of Nigeria. Results show that the factor having positive and significant impact on the probability of being credit constrained by the banks was the number of dependents of household. More factors were negatively and significantly affecting the banks' decision to ration credit; these were as follows: farm size of the farmers, previous year's income, enterprises type, household net worth and level of household agricultural commercialization.

Agricultural credit demand factors is categorized in the study of Mpuga (2010), who divides the factors that affect the demand for credit into two parts: first, the individual/household aspects and the features of the financial institutions. This comprises sex, age, level of income, education and marital status. Features of the financial institutions that may have impact on borrowers' decision to demand credit are: interest rate, other terms of the credit, and distance to the supplier.

Farmers' access to formal credit was also studied by Ibrahim and Aliero (2012). The results of their study provide empirical evidence that farmers' access to formal credit was significantly and positively affected by collateral, level of income, educational attainment and

marital status. While age and sex have insignificant positive impact. Besides, significant and negative factors were interest rate and transaction cost. Moreover, Gaisina (2010) studied the determinants of the credit access to banks and also investment activities of agricultural enterprises in Kazakhstan. Results indicate that access to subsidized credit is crucial. Besides the factors that influence highly the credit rationing are the size of arable land possessed by the agricultural enterprise and the cost of equipment (associated as collateral).

As already mentioned availability of credit is also considered as crucial factor for agricultural lending that was analyzed in the paper of Okerenta and Orebiyi (2005). Paper assessed the crucial factors that are taken into account by financial institutions in provision of credit to farmers in the observed area of Nigeria. According to results credit availability is vital in the supply of agricultural credit to farmers. On the other hand, transaction costs had small importance in the issue.

The supply of agricultural credit was studied by Onoja et al. (2012). They provide econometric analysis demonstrating that stock market capitalization, interest rate and immediate past volume of credit guaranteed by the Nigerian Agricultural Credit Guarantee Scheme Fund had significant influence on the quantity of institutional credit supplied to the agricultural sector for the analyzed period. Agricultural credit from both bank and farm side features was analyzed in the work of Betubiza and Leatham (1995). They developed the model to examine the effect of selected demand and supply factors on non-real estate agricultural lending by commercial banks in Texas, USA. Results show that banks have reduced their agricultural loan portfolios in response to increased use of interest sensitive deposits after deregulation. Demand and supply side factors affecting agricultural lending were also studied in the paper of Oluwasola and Alimi (2008). Here authors found that the interest rate, farm expenditure, the amount borrowed from alternative sources, farm size and savings were the main determinants of credit demand, while interest rates charged, the level of savings of respondents, the amount of loan demanded and the proportion of previous loans repaid were the major determinants of credit supply by the credit institutions in South-western Nigeria. Akudugu (2012) tried to estimate supply and demand side determinants of agricultural credit and found that in Ghana upper east region age of farmers, gender and political affiliations among others are the main determinants of credit demand by farmers. Some determinants of credit supply by the Rural Banks are farm size, type of crop grown and the amount of savings made.

The impact of agricultural loan policies on agricultural loan volume change from commercial banks was analyzed by Ladue and Thurgood (1991). Authors developed an econometric model of changes in agriculture loan volume of New York commercial banks. Results indicate that interest rate spread, borrower

analyses criteria and marketing policies are major determinants of agricultural loan amount. Also interesting is the paper of Laderman et al. (1991) who tried to explain the ratio of a bank's agricultural loans to its total loan portfolio by statistical model. Authors included bank related characteristics in the model such as its size (assets) and its aggressiveness in lending (deposit-to-loan ratio). In this context another interesting paper was produced by Bard et al. (2000); authors evaluated how changes in commercial banking structure are influencing credit availability and terms for selected farm business types. Tobit and OLS regression methods were used to assess bank characteristic effects on loan amount and rate. They found that loan amounts were not significantly influenced by bank characteristics. Furthermore Arosanyin (2003), when studying empirically rural credit supply by commercial banks in Nigeria, uses rural deposit mobilized and lending interest rate in the model.

Bank lending to agriculture is studied also in the paper of Afangideh (2010). The results show that in Nigeria domestic credit to the private sector, stock market capitalisation, real income and previous period bank lending to agriculture are affecting directly and positively bank lending to agriculture, but value traded ratio has a direct but negative effect.

We can say that agricultural credit provision is quite problematic and complex for banks because of several reasons analyzed in the paper of Pervaiz et al. (2011). They found that in Pakistan majority of the small farmers are deprived of getting loans, because almost all the financial institutions extend loans on grantee and capacity/ability to repay. Hence, the larger is the farm size the chances of access to loans increase.

Hypothesis #1: International donor organizations' loans and grants affect a bank agricultural loan portfolio positively and significantly.

Thus, the overall objective of this research paper is to examine the impact of international donor organizations' intervention on agricultural banking in African countries' banks.

The following is the research question:

Do international donor organizations' loans and grants to banks increase supply of agricultural credit from banks?

This research question refers to the issue whether financing of loan capital of banks by preferential credits and grants increase provision of agricultural loans from banks. Donors were assisting several banks in Africa to pave the way in untapped agriculture market. As Okerenta and Orebiyi, (2005) state that availability of credit is also considered to be extremely important factor in agricultural lending provision by banks. Most banks there were experiencing problems with relevant resources to enhance agricultural credit portfolio. For this aim they were providing preferential loans that were affecting agricultural lending portfolios. Hassan (2012) mentions that commercial banks totally depend on their

deposits for financing in agricultural credit. Donors have credit lines on the annual basis to promote banks to lend to agricultural sector as only their deposits conditions will not allow them to enter agricultural credit market. Like in the case of Kyrgyzstan, international donor organizations provided credit lines for agricultural lending; this is illustrated in the paper of Jacobson and Abduraimjanov (2007). In the same paper it is stated that banks became competitive because they were able to provide loan without asking for real estate as pledge and this accelerated loan disbursement. This is worth nothing because of donors' intervention banks were disbursing agricultural loans without requiring collateral and as a result clients were asking for more loans.

## METHODOLOGY

Previous researches on agricultural lending have mainly focused on the quality of agricultural loan portfolio. A number of studies have investigated various credit evaluation, credit risk and credit determinants on household or macro level. There is ample literature about socio-economic and household determinants of agricultural credit supply by banks. Less literature can be observed regarding bank specific determinants of agricultural credit supply. And most of the studies about aid effectiveness were concentrated on how foreign aid was affecting economic growth. However the effect of different types of donor aids directed to banking sector and their influence on the agricultural banks particularly on the size of the agricultural loan portfolio on bank was particularly neglected. Thus there is a need to shed light on the impact of donors' aids on agricultural loans extension on the bank level.

There will be constructed three models related to the bank supply of agri-credit.

Both demand and supply side factors affecting agricultural lending were analyzed in several papers. Theoretically, Greenwald and Stiglitz (1990) stated that bank commercial lending depends highly on the level of bank assets that comprise bank capital and deposits. Ozsuca and Akbostanci (2012) state that banks' supply of loans depends on the amount of deposits (hence, loanable funds) available, interest rate on loans and the monetary policy rate. Weller (2001), in his paper, uses a model of credit supply by banks under credit rationing (Greenwald and Stiglitz, 1990; Stiglitz and Weiss, 1981). Where, in the standard equation, each bank's supply of credit is hinged positively on its deposit, capital, opportunity costs of lending and borrowers' collateral.

The impact of donors' intervention on the supply of agricultural credit from banks is mostly based on the papers of Bard et al. (2000), Betubiza and Leatham (1995), Ladue and Thurgood (1991), Onoja et al. (2012), Oluwasola and Alimi (2008), who analyzed supply as well as demand side factors affecting agricultural lending from banks. One note: the model of this paper will not incorporate socio-demographic factors determining agricultural credit supply that were present in initial models of some aforementioned researchers, it will also explain the effect of various factors affecting agricultural credit supply from the prospective of commercial bank. Under the variable of donor loans (DL), the author is not going to use only the borrowings by the banks that were aimed to support directly banks' agricultural loan portfolios but also the borrowings that had considerable impact on banks' agri-credit issue; like, donor loans provided to banks for SME, microfinance or private enterprises lending purposes, etc. In African states these aforementioned lending activities are tightly related to agricultural finance. Besides for the same reason it will also be incorporated the donor loans to banks that were targeted for rural financial purposes. As in CGAP

report Pearce (2003) mentions donor agencies were traditionally considering rural finance and agricultural credit as the same things. In case single banks having several credit lines from donors that fall under the author's research interest, it will be used the sum of such borrowings. As international donor organizations, it is assumed that all the non domestic organizations and institutions that have financial and developing pattern and are providing loans and grants to other institutions fall under the scope of the author's research interest. All such borrowings related to donors stated in the banks' reports were analyzed and examined carefully. This work used the panel data analyses, except the model with dummy variable.

Based on previous research, there is linear relationship between agricultural credit supply from banks and its determinant factors. Donor related and non-related banks are analyzed separately. How their agricultural loan portfolio is affected by different bank related characteristics. The results will be compared and relevant conclusions drawn. Further, the additional regression will be performed: a dummy variable is used instead of a donor loan variable; 1 - for the banks that had such loans from donors that were affecting their agri-credit portfolio and 0 - if such a link does not exist. The model, in this case, will be formed as follows:

**Model 1:** (donor related and non-related banks together, specified by donor dummy)

$$BL_i = \alpha_0 + \alpha_1 DD_i + \alpha_2 IR_i + \alpha_3 BD_i + \alpha_4 BE_i + \alpha_5 BS_i + \alpha_6 NM_i + \alpha_7 BP_i + \alpha_8 BT_i + \epsilon_i$$

Here DD is a donor dummy that refers to banks related to donor loans and not related ones.

Agricultural banking is represented by banks' Agricultural lending (BL) that is assumed to be a function of Donor Dummy (DD), interest Rate on Agricultural Credit (IR), Bank time and saving deposit/total deposit ratio (BD), Bank equity/assets ratio (BE), Bank Organizational Size (BS) – total assets, Number of Markets in which bank operates (NM) – Bank's number of loans by segment, Bank Performance (BP) – return on assets as a performance indicator, Bank Type (BT) – Bank dummy variable, independent7holding (0=holding, 1=independent).

### Dependent variable

BL - Bank's agricultural loan portfolio

### Independent variables

DD - Donor Dummy (donor related bank=1, non related=0)

IR - Lending Rate on Agricultural Credit

BD – Bank time and saving deposit/total deposit ratio

BE – Bank equity/total assets ratio

BS - Total assets

NM - Number of loans by segment

BP - Return on assets

BT – Bank dummy (0=holding, 1=independent)

**Model 2:** (for only donor related banks)

$$BL_{i,t} = \alpha_0 + \alpha_1 DL_{i,t} + \alpha_2 IR_{i,t} + \alpha_3 BD_{i,t} + \alpha_4 BE_{i,t} + \alpha_5 BS_i + \alpha_6 NM_i + \alpha_7 BP_i + \alpha_8 BT_i + \epsilon_{i,t}$$

$\alpha_0$  – constant and  $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$  are coefficients,  $\epsilon$  is an error term.

Each  $i, t$  observation reflects the value of the dependent and explanatory variables in terms of  $i$  bank for  $t$  year.

DL – Donors' loans and grants for banks. The rest of variables are already explained above.

**Model 3:** (donor non-related banks separately)

$$BL_{i,t} = \alpha_0 + \alpha_1 IR_{i,t} + \alpha_2 BD_{i,t} + \alpha_3 BE_{i,t} + \alpha_4 BS_i + \alpha_5 NM_i + \alpha_6 BP_i + \alpha_7 BT_i + \epsilon_{i,t}$$

$\alpha_0$  – constant and  $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7$  are coefficients,  $\varepsilon$  is an error term.

Each  $i, t$  observation reflects the value of the dependent and explanatory variables in terms of  $i$  bank for  $t$  year. The variables are as explained above.

Some parts of total deposits are sensitive to the changes in interest rate. This part is represented by dividing savings and time deposits by total deposits (BD). Generally, positive relationship between BD and loans can be seen because the stability of funds that is loanable is improved by time and savings deposits. It means that banks require less liquidity and they can allocate more money for loans. On the other hand, negative relationship can also be seen. Deposits are affected by interest rates and banks may increase investments in assets that are interest rate sensitive and decrease their investments in loans. Banks may decide to make more investments in investment securities providing that interest rate movements of these securities are similar to the movements on deposits and hence this reduces interest rate risk. One measure that banks can take is use of interest rates on loans that are adjustable in order to make them more sensitive to the movements of interest rates. Though, extra transaction costs can emerge for the bank due to the repricing a loan and since the risk is transferred to a borrower the likelihood of a default of loan can also be increased. It is hard to say which effect will be stronger than other and hence sign on the estimated coefficient is not determined in advance.

Institution that is capitalized well is in a better position for taking a risk by making more investments in loans and less investments in safe assets such as government securities. Larger equity base will protect the bank against sound loan losses. However, institutions that are less capitalized may decide to make similar investment strategy for increasing anticipated profits, but it can be related to the greater risk. Because the expected returns are high they may invest in assets that are more risky, e.g. loans. Because of this the estimated coefficient of the ratio of total equity to its total assets, can not be determined.

In Bard et al. (2000)'s paper, they used the sum of all the assets of multi- bank holding company (MBHC) affiliates, and in unit or single bank holding company, they used the total assets of the individual bank. In this paper, the focus is only on bank or company level total assets and relative levels of returns on assets (ROA). For the statistical analyses it will be more valuable to use the data of the same level rather than taking consolidated data information that will make huge differences in the scales. The dummy variable whether the bank is part of holding or independent one is referred to capture the nature of such banks if they are more inclined to agricultural lending or not. Compared to holding affiliates independent ones may have more personalized services and probably will be more specialized in agricultural lending because of the loan officer's knowledge of the sector. When banks have bigger size and scope they tend to concentrate more on urban area rather than lending to such risky sector as agriculture. Such banks are likely to have high costs that could lead to lower amount lent and higher rates charged. Thus independent banks by offering lower rates on agricultural lending may put them in competitive edge in respect to holding affiliates. As a proxy instead of MBHC as it is stated in the paper of Bard et al. (2000), such approach is used: in case of group or consolidated financial statement found in the bank's annual report it will be considered as a part of holding, otherwise – independent.

Those banks operating on several bank markets may not be oriented on lending to agriculture since they possess wide range of customer and economic bases and various opportunities for loans and/or investments. Hence the number of markets operated by the bank and the loan amount might be negatively related.

Return on assets measures the profitability of bank. It is not easy to conclude how agricultural loans affect ROA, because ROA measures profitability over all assets. Nonetheless, Higher ROA of

the bank indicates its stronger financial position. Banks with stronger position are able to meet needs of borrowers more effectively by granting their requests on loans and hence positive relationship between ROA and the amount of loan can be seen. The author's interest variable is donor loans and grants for banks. All other variables are control variables.

Important explanatory variables are introduced in this model, that is donor aid for agricultural sector and donor loans and grants for banks. This variable will be based on annual information, which is obtainable from banks' individual annual reports.

It can be distinguished two types of impact of donors' intervention on agricultural banking in terms of loan volume. Firstly, donors may provide direct loans with very low interest rate or grants to some banks. There are credit lines as already mentioned before and also in some cases governments are mediators in the loan provision process from donors to target banks. Thus we are going to study agricultural loans of the African countries' banks.

The part of bank specific data (deposits, equity, assets, number of markets in which bank operates, bank type (independent/holding), return on assets, annual amount of agricultural credit by banks, banks' borrowings from international donor organizations) was obtained from individual annual reports. Rest of the data (agricultural lending interest rates) required more endeavors to obtain.

## Sample

The whole population of the banks consists of African low and lower middle income countries' banks. According to World Bank (2012) low and lower middle income countries in Africa are totally 43. And the banks that were counted according to the availability of relevant central banks' information are totally 578. Banks linked with donor loan projects and those without it are looked for. These two types of banks were analyzed separately; the determinants of agricultural lending and the role of donor loans were found and compared.

The final sample of African banks was formed after some filtrations done (Table 1). Following filtrations were made on the bank data. First of all, the banks with no agricultural lending in their loan portfolio were excluded from the sample. Next, the banks that were related to Islamic finance were dropped from the sample. Besides huge number of banks was neglected because of unavailability of relevant information, like having no annual reports published on web or even worse having no web-page for checking it. So the population consists of 81 African banks totally; from which 28 are related to international donor organizations, 46 banks have no such type of link with donors and 7 banks are not clear if they fall in the first group as they have borrowings from donors, whose purpose is not explained in their reports.

Information about agricultural lending rates was collected from 58 African banks, that is the final sample. All this information was obtained from direct calls that was quite tough in terms of negotiations with them because usually feedback was scarce.

Descriptive statistics of the sample of African low and lower middle income countries' banks was produced. The data are for 10 years period and are unbalanced. The number of banks is 58.

In Table 2, the units measured in the Mln. USD were converted according to the relevant year's local currency unit average exchange rate with USD for the period. The rates were obtained from World Bank's Africa Development Indicators' database.

## RESULTS

The model developed above was estimated; that is, the model where it is incorporated donor dummy variable. This model was analysed by Ordinary Least Squares



**Table 1.** Data: Bank level analyses.

Variable name	Source
Bank's agricultural loan amount (dependent variable)	Individual bank annual report
Donor loans and grants for banks	Individual bank annual report
Lending rate on agricultural credit	Direct call to each bank's relevant department
Bank time and saving deposit/total deposit	Individual bank annual report
Bank equity/total assets ratio	Individual bank annual report
Bank assets	Individual bank annual report
Return on assets	Individual bank annual report
Number of markets in which bank operates	Individual bank annual report
Independent/Holding Bank	Individual bank annual report

(OLS) regression. OLS regression was conducted on agricultural lending on donor dummy, bank time and saving deposit/total deposit ratio, bank equity/total assets ratio and bank agricultural lending rate. Logarithms are applied because there are different banks with different levels of scale. As observed a lot of banks from several African states have different sizes. The results of model 1 are shown in Table 3.

As we can observe only NM p value is insignificant. Before we go to the robustness checks we need to make correlation matrix to see how our model variables are correlated with each other. Table 4 summarizes the correlation matrix.

As can be observed from the table, multicollinearity is caused by BE, because this variable is in high correlation with other variables – BP and logBS (61 and 44% respectively). The standard procedure for resolving multicollinearity problem is dropping the highly correlated variable from the model. But further, variance inflation factor analyses were conducted. They confirmed high level of BE (2.21) respectively to others but according to “rule of thumb” it is not that high to be dropped from the without restrictions.

First of all we take a look at the statistical significance of the estimates. We see from the regression results that at 95% confidence interval, which we take as a low bound for statistical significance, the estimates of IR, DD, BE, logBS and BP are statistically significant even at 1% level, but we cannot claim still that the variables which are significant according to this regression results are in fact, statistically significant (Table 5).

Now the test about how reliable our estimates and standard errors are, is performed.

First of all, test should be conducted whether we removed too much variables from the model and problems with omitted variables are present. For this purpose, Ramsey RESET test for mis-specification, concretely for omitted variables is run. Null hypothesis of this test is that there are no omitted variables. The results are in Table 6.

We see that we reject null hypothesis and there is omitted variables in our model.

Now we go on testing residuals of our regression in order to see how robust our standard errors and consequently our confidence levels are. Therefore we will be able to answer the question, whether variables are in fact statistically significant or not.

We will conduct test for constant variance in residuals, homoskedasticity. If there is no constant variance in our residuals (that is, heteroskedasticity is present), it will cause our standard errors to be biased and therefore our significance levels will be misleading. For this purpose, Breusch-Pagan / Cook-Weisberg test for heteroskedasticity will be employed. Null hypothesis is that there is constant variance in our data, which are the residuals of the model. The chi-squared statistics of the test are presented in Table 7.

According to the test results, we rejected the null hypothesis. Another test for heteroskedasticity is conducted as well called White's test, with the same null hypothesis as in the previous case. Here we have chi-squared statistics  $\chi^2(25) = 36.45$  and  $\text{Prob} > \chi^2 = 0.7123$ . We see that in this case, we fail to reject null hypothesis.

Because of the heteroskedasticity problem, robust standard errors are used in the model. Below is the regression results of the model 1 with robust standard errors (Table 8).

Thus the analyses show that the regression is proved to be useful for characterizing the relationship between the observed variables. It is revealed that IR and BP are statistically significant (at 1% level) and negatively related with agricultural lending of the bank; besides the same relation is between BT, BD and bank agricultural loan amount, but these variables are significant at 5% level.

On the other hand BE is significantly (1% level) and positively affecting agricultural loan amount; the same can be said about logBS that is statistically significant at 5% level. The interpretation of Donor Dummy variable is as follows: in ceteris paribus donor related banks have their agricultural lending portfolio of 0.73% higher than non related ones.

Now we proceed with the Model 2 and Model 3 analyses that refer to donor related and non related

**Table 2.** The units measured in Mln. USD.

	Bank's agricultural loan amount (BL)	Bank time and saving deposit/total deposit (BD)	Bank equity/total assets (BE)	Donor Dummy (DD)	Agriculture lending rate (IR)	Donor Loans and grants (DL)	Bank size (BS)	Return on Assets (BP)	N. of markets operat. (NM)	Holding Dummy (BT)
Unit of measurement	Mln. USD	Decimal	Decimal	1=donor 0= non donor	Decimal	Mln. USD	Mln. USD	Decimal	Number	0=hold. 1=indep.
Minimum	0	0,1	0,0	0	5,1	0	10,3	0,1	2	0
Maximum	463,7	1,0	1,0	1	45,8	281	14172	108,3	20	1
Mean	31,5	0,6	0,2	0,4	18,3	5,6	910,1	5,5	7,9	0,5
standard deviation	63,3	0,2	0,2	0,5	7	22,7	1668,6	12,8	3	0,5
number of banks	58	58	58	58	58	58	58	58	58	58
number of years	10	10	10	10	10	10	10	10	10	10
Observations	244	244	244	244	244	244	244	244	244	244

**Table 3.** Regression  $\log BL_{i,t} = \alpha_0 + \alpha_1 DD_{i,t} + \alpha_2 IR_{i,t} + \alpha_3 BD_{i,t} + \alpha_4 BE_{i,t} + \alpha_5 \log BS_{i,t} + \alpha_6 NM_{i,t} + \alpha_7 BP_{i,t} + \alpha_8 BT_{i,t} + \epsilon_{i,t}$ 

Variables	Coefficient s	Std. error	t-value	P> t	95% confidence interval	
Constant	3.824727	1.30781	2.92	0.004	1.248198	6.401256
DD	0.7314314	0.1363565	5.36	0.000	0.4627941	1.000069
IR	-0.03495	0.0096371	-3.63	0.000	-0.0539361	-0.0159639
BD	-0.5120443	0.2905734	-1.76	0.079	-1.084506	0.0604174
BE	2.26849	0.5530974	4.10	0.000	1.178827	3.358152
logBS	0.3696471	0.1317061	2.81	0.005	0.1101716	0.6291225
NM	0.0277054	0.0215073	1.29	0.199	-0.0146664	0.0700772
BP	-0.0179662	0.0063571	-2.83	0.005	-0.0304903	-0.0054421
BT	-0.3349121	0.1424731	-2.35	0.020	-0.6155997	-0.0542245

banks' analyses.

At First, the Pooled OLS regression is carried out based on model 2:

$$BL_{i,t} = \alpha_0 + \alpha_1 \log DL_{i,t} + \alpha_2 IR_{i,t} + \alpha_3 BD_{i,t} + \alpha_4 BE_{i,t} + \alpha_5 \log BS_{i,t} + \alpha_6 NM_{i,t} + \alpha_7 BP_{i,t} + \alpha_8 BT_{i,t} + \epsilon_{i,t}$$

For Pooled OLS regression model it is assumed

that  $\epsilon_{i,t}$  is normally distributed, the regressors are contemporaneously exogenous and there is no perfect collinearity.

We can see that obtained coefficient of three explanatory variables (BE, BT and BP) turned out insignificant (results of regressions and correlation matrix is given in appendices, see Appendix 1,2 and 3). According to "rule of thumb" it is removed

from the model the variable that had VIF more than 10; such variable was BP. (see Appendix 3\_1). Thus further analyses will be conducted on the restricted model.

The results of restricted Pooled OLS regression show significance of the coefficients of logDL, BD, IR, NM and logBS explanatory variable given in restricted model.

**Table 4.** Correlation matrix (Donor Dummy model).

Variable	logBL	BD	BE	IR	DD	BT	NM	BP	logBS
logBL	1.0000								
(P value)									
BD	-0.0963	1.0000							
(P value)	(0.1335)								
BE	0.1632**	0.0764	1.0000						
(P value)	(0.0107)	(0.2343)							
IR	-0.3123***	-0.0307	-0.0299	1.0000					
(P value)	(0.0000)	(0.6329)	(0.6424)						
DD	0.3315***	0.1478**	0.0249	-0.1003	1.0000				
(P value)	(0.0000)	(0.0209)	(0.6992)	(0.1181)					
BT	-0.2528***	0.0843	-0.2484***	-0.2108***	-0.1560**	1.0000			
(P value)	(0,0001)	(0.1895)	(0.0001)	(0,0009)	(0.0147)				
NM	0.0588	-0.2000***	0.1482**	-0.0572	-0.2196***	-0.0734	1.0000		
(P value)	(0,3601)	(0.0017)	(0.0205)	(0.3739)	(0.0005)	(0,2536)			
BP	0.0179	0.0191	0.6112***	0.0759	0.2141***	-0.1789***	0.2292***	1.0000	
(P value)	(0,7803)	(0.7670)	(0.0000)	(0.2376)	(0.0008)	(0.0051)	(0.0003)		
logBS	0.2840 ***	-0.1589**	-0.4433***	-0.2735***	0.1378**	-0.1997***	0.0509	-0.3326***	1.0000
(P value)	(0.0000)	(0.0130)	(0.0000)	(0.0000)	(0,0314)	(0,0017)	(0,4285)	(0.0000)	

Note: \*\*\*, \*\* and \* denote significance level of rejecting the null hypothesis respectively at 1, 5 and 10 percent level.

**Table 5.** Variance inflation factor (VIF) analyses.

Variable	VIF	1/VIF
BE	2.21	0.451951
BP	1.92	0.521156
LogBS	1.85	0.540141
BT	1.47	0.680544
IR	1.34	0.744978
DD	1.30	0.768031
NM	1.23	0.809726
BD	1.10	0.910635
Mean VIF	1.55	

**Table 6.** Ramsey RESET test.

<b>F(3, 234)</b>	3.92
Prob > F	0.0094

**Table 7.** Breusch-Pagan / Cook-Weisberg test for heteroskedasticity.

<b>chi2(1)</b>	13.18
Prob > chi2	0.0003

The results of restricted Pooled OLS regression show significance of the coefficients of logDL, BD, IR, NM and logBS explanatory variable given in restricted model.

Now the test about how reliable our estimates and standard errors are is performed.

According to the results of the tests, the null hypothesis about absence of omitted variable in restricted model is rejected, but absence of heteroskedasticity is not rejected. Before stating the relevance of Pooled OLS model based on abovementioned tests, it should be underlined that in Pooled OLS regression banks' unobservable individual effects are not controlled, while individuals (banks) of Panel Data are different and may have individual influence on explained variable.

We will use Breusch and Pagan's LM Test to determine the relevance of unobservable individual effects. The null hypothesis of this test is the irrelevance of unobservable individual effect and the alternative hypothesis is relevance of unobservable effect. The result shows that null hypothesis is strongly rejected, hence we can state that unobservable individual effect by banks is relevant and the Pooled OLS regression model is not appropriate for making the conclusions and other model should be used presented by this equation (restricted):

$$\log BL_{i,t} = \alpha_0 + \alpha_1 \log DL_{i,t} + \alpha_2 BD_{i,t} + \alpha_3 IR_{i,t} + \alpha_4 NM_{i,t} + \alpha_5 \log BS_{i,t} + \alpha_6 BE_{i,t} + \alpha_7 BT_{i,t} + c_i + \epsilon_{i,t}$$

In the framework of which unobservable individual effect is incorporated -  $c_i$  is banks' unobservable individual effect.

Based on this model the Random Effect Panel Data regression and Fixed Effect Panel Data regression has to be conducted. The results are given in appendix 2.

Further process of selection relevant model depends

**Table 8.** regression with robust standard errors  $\log BL_{i,t} = \alpha_0 + \alpha_1 BD_i + \alpha_2 BE_i + \alpha_3 IR_i + \alpha_4 DD_i + \alpha_5 BT_i + \alpha_6 NM_i + \alpha_7 BP_i + \alpha_8 \log BS_{i,t} + \epsilon_i$ 

Variables	Coefficient s	Robust Std. error	t-value	P> t	95% confidence interval	
BD	-0.5120443	0.2511345	-2.04	0.043	-1.006.807	-0.0172817
BE	226.849	0.4166246	5.44	0.000	1.447.693	3.089.286
IR	-0.03495	0.0099151	-3.52	0.001	-0.0544839	-0.015416
DD	0.7314314	0.1499936	4.88	0.000	0.4359274	1.026.935
BT	-0.3349121	0.1475493	-2.27	0.024	-0.6256004	-0.0442238
NM	0.0277054	0.0181219	1.53	0.128	-0.0079967	0.0634076
BP	-0.0179662	0.0036821	-4.88	0.000	-0.0252203	-0.0107121
logBS	0.3696471	0.1433962	2.58	0.011	0.0871408	0.6521533
Constant	3.824.727	1.391.678	2.75	0.006	1.082.967	6.566.486

**Table 9.** Results of Hausman Test and Sargan-Hansen Over-Identification Test.

Variable	Model 2		Model 3	
	RE	FE	RE	FE
The Hausman Test:				
	$\chi^2$	15.16		26.91
	(P value)	(0.0340)		(0.0002)
The Over Identification Test:				
	$\chi^2$ (Robust)	27.181		24.888
	(P value)	(0.0003)		(0.0004)

Note: \*\*\*, \*\* and \* denote significance level of rejecting the null hypothesis respectively at 1,5 and 10 percent level.

on whether  $\epsilon_i$  is correlated with explanatory variables. We should use Hausman test and Sargan-Hansen Over-Identification Test for testing the existence of correlation between unobservable individual effect and explanatory variables. The null hypotheses of both tests are absence of correlation between unobservable individual effect and explanatory variables and alternative hypothesis is existence of correlation. If the null hypothesis is not rejected, we can consider Random Effect Panel Data model most appropriate way of carrying out the analysis. If the null hypothesis is rejected, Fixed Effect Panel Data model will be considered as most relevant.

The results in Table 9 show that we rejected the null hypothesis. Hence there is correlation between unobservable individual effects and explanatory variables and Fixed Effect Panel Data regression is appropriate for given data.

It should be noted that all the above mentioned regressions are held ignoring the possible existence of serial correlation and heteroskedasticity and the results can be used only assuming the absence of auto-correlation and heteroskedasticity in the analysed data. The small sample size and unbalanced data made it impossible to calculate and use heteroskedasticity and serial correlation consistent estimates. These led to insignificant statistics.

As a result, assuming the absence of heteroskedasticity and serial correlation in analysed data, based on the Random effect panel data model that revealed to be most appropriate for analysing the dependence of the bank's agricultural loan portfolio on international donor organizations' loans, we can suppose that positive and statistically significant dependence exists between agro credits and donor loans. (Coefficient of logDL equals to 0.08).

The same tests and assumptions revealed that fixed effect model is the most appropriate one for the Model 3 (donor non related banks).

By the model 3 analyses we can see that other control variable's influence on agricultural lending volume (results of regressions and correlation matrix are given in appendices, see Appendix 1,2 and 4).

In the model 3 our tests showed that we have to use fixed effect analyses. The VIF results (appendix 4\_1) showed to proceed without dropping any variable. Thus no restrictions will be held on the model.

We can observe from the regression results that BD is statistically significant even at 99% confidence interval. Though, IR reveals to be not significant. Other variable that is statistically significant is NM (5% significance level).

The results are different donor related bank analyses;

in the first case we can see that banks' size is important explanatory variable for agricultural lending in African banks; in the second group of banks, time saving deposit ratio to total deposit and number of markets operated by the bank (NM) are statistically significant variables. On the other hand both groups of banks showed that agricultural lending interest rate does not matter much for banks' agricultural loan issue.

Results of this study are partially in line with previous studies, where it was analyzed agricultural lending portfolios' determinants in different countries' banks. In particular, previous studies revealed that bank side factors that were statistically significant were deposits and interest rate. In this case deposit confirmed its importance, but interest rate did not reveal to be an important factor explaining agricultural lending portfolio of African banks. This research is slightly confronting results of Bard et al. (2000) where they observed that banks' characteristics were not significantly affecting agricultural loan amounts of the banks, as in this paper bank deposit appeared to play important role as a factor affecting the bank's agricultural loan portfolio.

## Conclusion

From the literature review it is observed that this issue in this paper was practically never analysed. Especially, African states and banks are not highly studied from agricultural financial point of view. This is due to the lack of information, problems with obtaining data and uncertainty of finalizing the project. Such analyses related to studying the impact of international organizations' intervention on agricultural banking on the micro and macro level is quite interesting and challenging at the same time. It is a gap that needs to be filled.

Several bank related variables were selected in order to capture well the research aim and to demonstrate some determinants and the role of donors' intervention in this context in terms of African banks' agricultural loan portfolios.

Results show that international donor organizations have positive impact on African banks' agricultural lending volume. It can also be stated that in donor related banks, asset size play important role in the issue of agricultural loans and in non related banks such factor is bank deposit ratio; while interest rate on agricultural lending stay insignificant in both cases.

Overall we can say that this study is a pioneer in analyzing micro consequences of international donor organizations intervention on agricultural banking. What is observed from the results first of all is that deposits are highly important factor in agricultural lending. Previous studies, researches, several relevant organizations' reports and publications state that banks should stay self sustainable and viable to be able to create will to lend to such risky sector as agriculture. Depending totally on donor funds revealed not to be efficient. In this scenario

deposits are important factor in the structure of banks' well functioning. Along with some donor funds that will enable commercial banks to concentrate on agricultural lending, increase in deposit volume will also contribute to the issue of agricultural credit.

## Conflict of Interests

The author have not declared any conflict of interests.

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**Appendices**

**Appendix 1. Results of Pooled OLS regression**

	<b>Model 2</b>		<b>Model 3</b>	
	<b>Pooled OLS</b>	<b>Pooled OLS (restricted)</b>	<b>Pooled OLS</b>	
logDL	0.0668118**	0.0684072**		
(Standard error)	(0.0329752)	(0.0324833)		
BD	-1.303131***	-1.235753***	0.1672292	
(Standard error)	(0.4702215)	(0.425109)	(0.3863729)	
BE	1.047055	0.6089943	1.683126***	
(Standard error)	(1.438705)	(0.6593008)	(0.6250143)	
IR	-0.0640839***	-0.062711***	-0.0394383***	
(Standard error)	(0.0219584)	(0.0214833)	(0.0117929)	
BT (Standard error)	-0.0163539 (0.1880194)	-0.0164595 (0.1870848)	-0.5787947*** (0.1994172)	
NM (Standard error)	0.0826379* (0.0441265)	0.0759668* (0.0394129)	0.0345694 (0.0254131)	
BP (Standard error)	-0.0049091 (0.0143111)		-0.0011354 (0.036135)	
logBS (Standard error)	0.6939919*** (0.2212925)	0.7258852*** (0.199815)	-0.0220207 (0.1386313)	
Constant	1.945073	1.682272	7.011471***	
(Standard error)	(2.250049)	(2.105089)	(1.41029)	
R <sup>2</sup> Adjusted	0.4306	0.4362	0.1978	
F Test	10.07	11.61	6.14	
(P value)	(0.0000)	(0.0000)	(0.0000)	
Ramsey RESET test F=	7.50	7.20	0.12	
(P value)	(0.0002)	(0.0002)	(0.9459)	
Breusch-Pagan test X <sup>2</sup> =	47.98	49.47	3.29	
(P value)	(0.0000)	(0.0000)	(0.0698)	
White's test X <sup>2</sup> =	67.61	51.44	58.66	
(P value)	(0.0097)	(0.0280)	(0.0054)	
Breusch-Pagan LM test X <sup>2</sup> =		64.43***	80.03***	
(P value)		(0.0000)	(0.0000)	

Note: \*\*\*, \*\* and \* denote significance level of rejecting the null hypothesis respectively at 1, 5 and 10 percent level.

**Appendix 2. Regression results of random effects (RE) and fixed effects (FE) panel data models.**

	<b>Model 2</b>		<b>Model 3</b>	
	<b>RE (restricted)</b>	<b>FE (restricted)</b>	<b>RE</b>	<b>FE</b>
logDL	0.0839067***	0.0609137*		
(Standard error)	(0.0279292)	(0.033773)		
BD	-0.107184 (0.5951288)	1.198792 (0.8278618)	1.149224** (0.4666043)	1.784301***
(Standard error)				(0.589641)
BE (Standard error)	1.047617 (0.7047381)	1.664706 (1.049236)	-0.3347394 (0.7017029)	-1.782616 (0.9502893)
IR	-0.0191121	0.0091957	-0.0157923	0.0127356
(Standard error)	(0.0271231)	(0.0354274)	(0.0172231)	(0.0282502)
BT	0.0649036	0.4831541	-0.6773489*	Omitted
(Standard error)	(0.2500202)	(0.4393466)	(0.3457344)	
NM(Standard error)	0.0083587 (0.0579724)	-0.0318507 (0.0957095)	-0.0671263* (0.0374957)	0.1396422** (0.0697848)
BP (Standard error)			-0.0213553 (0.0299979)	0.0157872 (0.0335398)
logBS(Standard error)	1.101608*** (0.2689945)	1.683908*** (0.5190924)	0.0875972 (0.1253035)	0.1879008 (0.1353888)
Constant	-2.740916	-8.909789*	5.389443***	2.706819
(Standard error)	(2.656741)	(4.625077)	(1.44357)	(1.639884)
R <sup>2</sup>	0.3887	0.2034	0.0764	0.0061
Wald X <sup>2</sup>	49.76***		15.17**	
(P value)	(0.0000)		(0.0339)	
F Test		7.92***		10.54***
(P value)		(0.0000)		(0.0000)

Note: \*\*\*, \*\* and \* denote significance level of rejecting the null hypothesis respectively at 1, 5 and 10 percent level.

**Appendix 3.** Correlation matrix of donor related bank model (model 2).

	logBL	logDL	BD	BE	IR	BT	NM	BP	logBS
logBL	1.0000								
(P value)									
logDL	0.1239	1.0000							
(P value)	(0,2265)								
BD	-0.3284***	0.1790*	1.0000						
(P value)	(0.0010)	(0.0793)							
BE	-0.0682	0.1792*	0.1003	1.0000					
(P value)	(0.5069)	(0.0790)	(0.3283)						
IR	-0.4519***	-0.0300	-0.0444	0.0892	1.0000				
(P value)	(0.0000)	(0,7705)	(0.6662)	(0.3850)					
BT	-0.2260**	-0.2408**	0.0810	-0.2516**	0.1522	1.0000			
(P value)	(0,0260)	(0,0175)	(0.4301)	(0.0129)	(0,1367)				
NM	0.0732	0.0150	-0.1764*	0.3819 ***	0.3457 ***	-0.2667***	1.0000		
(P value)	(0,4759)	(0,8838)	(0.0839)	(0.0001)	(0,0005)	(0,0083)			
BP	-0.0841	0.0897	-0.0548	0.9199***	0.1749*	-0.2360**	0.5179 ***	1.0000	
(P value)	(0,4130)	(0,3823)	(0.5942)	(0.0000)	(0,0866)	(0,0200)	(0.0000)		
logBS	0.5445***	-0.0819	-0.2497 **	-0.5092***	-0.5307***	-0.0904	-0.2094**	-0.5599***	1.0000
(P value)	(0.0000)	(0,4251)	(0.0136)	(0.0000)	(0.0000)	(0,3788)	(0,0395)	(0.0000)	

Note: \*\*\*, \*\* and \* denote significance level of rejecting the null hypothesis respectively at 1, 5 and 10 percent level.

**Appendix 3\_1.** model 2 VIF results.

Variable	VIF	1/VIF
BP	11.52	0.086842
BE	8.79	0.113733
logBS	2.81	0.356107
IR	1.90	0.525629
NM	1.89	0.529299
BD	1.45	0.689636
BT	1.29	0.776300
logDL	1.15	0.870576
Mean VIF	3.85	

**Appendix 4.** Correlation matrix of Donor non related bank model (model 3).

	logBL	BD	BE	IR	NM	BP	logBS	BT
logBL	1.0000							
(P value)								
BD	-0.0332	1.0000						
(P value)	(0.6896)							
BE	0.3500***	0.531	1.0000					
(P value)	(0.0000)	(0.5226)						
IR	-0.2382***	0.0874	-0.0864	1.0000				
(P value)	(0.0037)	(0.2923)	(0.2980)					
NM	0.1841**	-0.1738**	0.0238	-0.2305***	1.0000			
(P value)	(0,0256)	(0.0353)	(0.7750)	(0,0050)				
BP	-0.0327	0.2046**	-0.0064	0.1589 *	0.0692	1.0000		
(P value)	(0,6943)	(0.0129)	(0.9388)	(0,0545)	(0,4048)			
logBS	0.0005	-0.1386*	-0.3693***	-0.1413*	0.1832**	-0.1524*	1.0000	
(P value)	(0,9951)	(0.0941)	(0.0000)	(0.0879)	(0,0264)	(0,0655)		
BT	-0.2085**	0.1297	-0.2453***	-0.4053 ***	-0.0282	-0.0139	-0.1676**	1.0000
(P value)	(0,0113)	(0.1173)	(0.0028)	(0.0000)	(0,7346)	(0,8676)	(0,0425)	

Note: \*\*\*, \*\* and \* denote significance level of rejecting the null hypothesis respectively at 1, 5 and 10 percent level.



**Appendix 4\_1.** Model 3 VIF results.

<b>Variable</b>	<b>VIF</b>	<b>1/VIF</b>
BT	1.66	0.601281
IR	1.56	0.642633
BE	1.51	0.661443
logBS	1.51	0.662316
NM	1.15	0.872808
BD	1.13	0.888701
BP	1.11	0.897573
Mean VIF	1.38	