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GLOBAL LARGE-SCALE LAND INVESTMENT IN AFRICA: IMPLICATIONS FOR THE ENVIRONMENT

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ABSTRACT

The attainment of sustainable development goals (SDGs) in Africa will depend in part on its endowment, productivity and management of the land resource. Thus, due to the multipurpose usage of the land, there is more interest in its acquisition and usage, which often lead to competition among investors. More so, the intensive use of land for economic activities often impacts on the environment. This has implication for the target countries' sustainable development. It is on this basis that this study investigates the effects of large-scale land investments on the environment. The study adopts the sample selection model to find that at the decision to invest, there is the tendency the environment gets more deplorable while the foreign investors sustainably use the land and this is not the case for domestic investors. At the actual large-scale land investment level, the foreign large-scale land investment has adverse effects on the environment, but they maintain sustainable use of land, while the domestic large-scale investment negatively impacts on both the environment and the sustainable land use. Climate change impeded the availability of large-scale land. Thus, although the large-scale land investments could mitigate the challenges of national food insecurity, there should be intense efforts by the government to continuously monitor and regulate the activities of these investors to conform with global environmental best practices.

Keywords: *Environment, Land Investments, Large-scale, Gravity model, Africa.*

INTRODUCTION

The economic potentials of countries in part depend on their natural resources' endowment and productive utilization. Land ownership or otherwise indicates the status of an economic agent in society. More so, the attainment of SDGs by developing countries, particularly Africa will depend in part on their endowment, productivity and management of the land resource. More than half of SDGs target goals are directly related to this natural resource. Hence, the importance of land to the sustainable development aspirations of countries, particularly resource endowed, cannot be overemphasized. Land remains an invaluable natural resource that is precious to man, but it is non-renewable. The non-renewability of land and

the scarcity of fertile land led to its increasing demand. More so, the multipurpose usage of the land enhances interest in its acquisition. Moreover, owing to the effects of mineral exploration, urbanization, environmental degradation, etc, the availability of fertile and arable land becomes increasingly difficult. This has implication for sustainable development, especially for the vulnerable people in the rural areas, since they depend largely on land for their livelihood. Many people in Africa depend on land for their economic activities and/or livelihood. This is because it is from it that food is provided, shelters are constructed, infrastructures are laid and other valuable minerals are found. Kareem (2014) finds that 52% of the total employment in Africa is in the agricultural sector. Thus, access to land has become more competitive among large-scale land investors in Africa, while the availability of fertile and productive land is becoming increasingly difficult owing to the influx of large-scale land investors to Africa.

Many of the plantation investments caused environmental degradation without tangible rural development. This led to limited access to fertile land which necessitated frequent struggle for the acquisition of arable land and conflicts over the best usage. Moreover, the large-scale land investments could lead to acrimony and crisis between the investors and landowners, communities and smallholder farmers. There are great possibilities that these acquisitions could crowd-out subsistence farmers that often make use of fallow land. To prevent these problems, the government regulates and manages land acquisitions to ensure sustainable use of the precious resource. Besides, government institutions are strengthened to monitor and evaluate these acquisitions to ensure the best environmental practices and standards across the board. Available evidence indicates that there are a lot of challenges to land governance, while the preponderance of controversies, public outcry, crowding-out and welfare depletion due to the land investments is worrisome.

Furthermore, the recent economic events, particularly the commodity crisis of 2007-2008, have shown that there had been increasing demand for land in the global south, especially in Africa, which affected the availability of fertile land. Evidence has shown that the demand for land has increased over time and the trend is expected to continue in the future, especially for Africa that has about 5% of its total agricultural areas invested, which is like the territory of Kenya (Kareem, 2018). Although some African countries promote agricultural investment, the Comprehensive Africa Agricultural Development Programme of the African Union Commission specifically enjoined national agricultural investment as part of its programme – at least 10% of the national budget (Kareem, 2016a). This cannot be the main reason for the volume of land investments. Other factors could have accounted for the investments exogenously, in which external agents such as the foreign investors are deeply involved, especially during the spike in global commodity prices – foreignization of space (Zoomers, 2010).

Studies in this area of research often focus on the effects of land deals, acquisition, transaction, ownership, tenure and reform on both micro and macroeconomic variables without determining the sustainability of the land investments and its

environmental impact (Deininger et al., 2015; Deininger and Byerlee, 2012). A segment of the literature examines the effects of ownership of land and land grab on development in developing countries and normatively reflect on the drivers of the land investment. Similarly, in the context of Africa, some studies evaluate agricultural investments and international land deals in Africa to determine whether the investment is a land grab or development opportunity (Schoneveld, 2014; Kareem, 2016b). Some studies have econometrically determines the impact of foreign land deals in Africa on agricultural trade (Kareem, 2018; Arezki et al., 2015). Thus, a critical review of the literature indicates that only scanty empirical studies exist on the effects of large-scale land investments on the environment. Majority of the related literature either apply normative, qualitative or descriptive analysis (Di Matteo and Schoneveld, 2016).

It is on this basis that this study investigates the extent to which large-scale land investments impacts on the environment in Africa using an augmented Helpman, Melitz and Rubenstein model. This study uses data from the Land Matrix for the large-scale land investments and got other data from the World Development Indicators of the World Bank. This model is a selection bias model with firms' heterogeneity which uses a Poisson.

MATERIALS AND METHODS

The data for the empirical analysis in this study is sourced from the Land Matrix, which is used in the background and more specifically the model's land investment contract size. These data contain 702 land investment deals that cut across the period of 2000 to 2015. Other sources of data are the World Development Indicators of the World Bank, World Integrated Trade Solution database of the World Bank, and time and date website for bilateral distance.

The study's methodological framework is derived from Helpman, Malitz and Rubinstein (2008) – hereafter called HMR - selection model that includes firm heterogeneity and correct for sample selection bias and specification error with nonrandom zero[1]. This study departs from previous studies by adopting the HMR model to the bilateral investments' framework. Large-scale land investments are carried out with different outcomes; there are land transactions that are concluded, failed deals, some under negotiations, and there are expressions of interest. In all the transaction outcomes, only those that have been concluded are the actual and positive investments, however, others have no value of the outcome and thereby at present no investment, but in the future, the transaction might be concluded especially for those under negotiation. Consideration of only the concluded transactions (positive investment) will lead to selection bias. Thus, the HMR is adopted to control for both the sample selection bias and the investors' countries heterogeneity bias with adequate consideration for bilateral zero investment flows in a two-step estimation procedure. First-step estimates a binary equation (probit

[1] See Kareem and Kareem (2014) and Helpman, et al. (2008) for a comprehensive description of the model

regression) for the probability of large-scale land investment at the heterogeneous firm/country level, which is the extensive margin of investment – the decision to invest. The second step involves a count model of investment estimated in its logarithm form and entails using the predicted probabilities obtained in the first step to estimate the effects on large-scale land investments' sustainable environmental land use (intensive margin of investment). The model is specified as follows:

$$T_{ijt} = \beta_1 + \gamma_{it} + \rho_{jt} + C_{ij}\vartheta + \pi E_{ijt} + \varepsilon_{ijt} \quad (1)$$

where T_{ijt} is a binary variable that equals 1 if the number of land deals from country i to j at time t is nonzero; otherwise, it is 0. The intercept is β_1; the investor and target countries fixed effects are γ_{it} and ρ_{jt}, respectively; C_{ij} is a vector of pair-varying control variables such as distance, language, arable land, institutions and governance variables as well as others included. E_{ijt} is the exclusion variable[2] that does not enter the second – stage regression.

The second-stage equation relies on a standard count model represented in a general form of a conditional probability function as:

$$\Pr(Y_{ijpt} = y_{ijt} \mid x_i) = \frac{\exp(-\exp(x'_{ijt}\beta))\exp(y_{itj}x'_{ijt}\beta)}{y_{ijt}!} \quad (2)$$

where subscripts i, j, p and t denote investor, target country, intention/sector and time respectively; y is the count variable, in this case, the available fertile land owing to the environmental large-scale land degradation in Africa; x is the vector of independent variables of the model and β is the vector of the associated parameters. The model is specified as:

$$Fertile\_land_{ijpk} = \beta_0 + \beta_1 Land\_deals_{ij} + \beta_1 Demographic_j + \beta_2 Economic\_size_{ij} + \beta_3 Trade_j + \beta_4 Pr\,o\,duction_j + \beta_5 Institution_j + \beta_6 Governance_j + \beta_7 Natural\_resources_{jt} + \beta_8 Energy_j + \beta_8 Security\_safety_j + \pi_{ij} + \delta_i + \delta_j + \delta_s + \mu_{ijpt}) \quad (3)$$

From equation 3, the dependent variable is the available fertile land, a measure of the environment, owing to the degradation of the environment from the activities of the large-scale land investors. The parameters δ_i, δ_j and δ_s are the investor country, target country and sector/intention of investment fixed effects. The investor and target countries fixed effects stand for the multilateral investment resistance variables. Finally, π_{ij} is the inverse Mill ratio that is derived from the first-step regression, which is used in the second step. The inverse Mill ratio is the ratio of the probability density function (PDF) and the cumulative density function (CDF) of the normal distribution, which is evaluated at the predicted outcomes divided by the standard error of the probit estimation. A Poisson estimator is

[2] For further reading on exclusion variable see Kareem (2016a)

employed based on the fact that the assumption of equi-dispersion of the Poisson estimator is unlikely to hold.

The Land Matrix provided the data used in the background and more specifically the model's land investment contract size. These data contain 702 land investment deals that cut across the period of 2000 to 2015. Other sources of data are the World Development Indicators of the World Bank, World Integrated Trade Solution database of the World Bank, and time and date website for bilateral distance.

EMPIRICAL RESULTS

Extensive Margin of Large-Scale Land Investment

The second column of table 1 shows that the decision to conclude more land deals would possibly increase the rate by which the environment is degraded. The environment would be depleted by 0.32% for every per cent decision made to increase land deals. Hence, the environment could be degraded as the probability and/or the decision to conclude more land deals increases. The estimates indicate that the probability of the large-scale land investors to intensively apply fertilizer on the land would have significant adverse effects on the environment such that a unit increase in fertilizer application adversely affects the environment by 0.6%. The intensity of fertilizer application, especially the chemical fertilizers, tends to hardened the soil and thereby strengthened pesticides as well as pollute water and air and thus, release greenhouse gases that are hazardous to human health and the environment. The energy intensity would significantly and negatively impact on the environment at this margin of land investment such that a per cent increase in the energy intensity would probably make the environment deplorable by 1.5% for pool estimates while 0.6% and 0.4% are the foreign and domestic land investments, respectively. The volume of farm yields which shows the land fertility often propel large-scale investors to such destinations, which in turn have effects on the soil's nutrients and greenhouse gas emission. The estimate indicates the farm yields, measured by cereal yields, does not adversely impact on the environment (-1.5) The implies that the tendency to apply modern technologies on the farm would have adverse effects on the soil composition and the environment. Precipitation, a measure of the climatic condition, which ought to increase the fertility of the land have a significant adverse effect on the environment for both the pool and foreign estimates while the domestic estimate is insignificant. Institutions, measures by the business regulatory environment, tend to contribute to the deplorable state of the environment in Africa. Since, the land regulatory agencies and governance in Africa are weak (see Kareem, 2018), this would lead to an inadequate contract and standard enforcement and thereby propelling large-scale land investments that utilize the land in such a way that would affect the environment and land sustainability – against global best practices.

Table 1. Extensive and intensive margins

Variable	Extensive margin	Intensive margin
Land deals	0.3247[a] (0.0621)	0.3548[a] (0.0579)
Fertilizer	0.5885[a] (0.1510)	-0.3993[a] (0.0047)
Energy intensity	1.5137[b] (0.6577)	0.3501[a] (0.0115)
Yield cereals	-1.4588[a] (0.2618)	0.1190[a] (0.0275)
Precipitation	1.9069[a] (0.2598)	-0.5994[a] (0.0308)
Business regulatory environment	2.1955[a] (0.5793)	0.0150 (0.0235)
GDP target country	0.2222[a] (0.0663)	0.2406[a] (0.071)
Language	-0.0946[a] (0.0250)	
Inverse Mill Ratio		-0.6551[a] (0.0222)
Constant	-7.2987[a] (2.3565)	-0.0772[a] (0.0812)
Observation	18,244	18,474
Wald Chi2	2183.87 (0.0000)	
Pseudo R^2		0.6112

Source: Computed. Note that a, b and c stand for 1, 5 and 10% significant levels. The figures in parentheses are the robust standard errors. All variables are in log form except the dummy variables. The fixed effects are included.

Intensive Margin of the Large-Scale Land Investment

In terms of the actual large-scale land investments, the rise in the land deals leads to a significant depletion in the environment to the extent that a per cent rise in the land transactions decreases land fertility by 0.35% owing to the economic activities on the land. The intensiveness of the use of fertilizers significantly did not adversely affect the environment, which implies that chemical fertilizers and other environmental damaging chemical were not applied to the land. Hence, the fertilizers usage tends to nourish the soil such that a per cent increase in fertilizers application by all the investors improve the soil nutrient by 0.4% and the magnitude of the impact is same for all categories of land investors. However, the energy intensity significantly leads to environmental degradation with the largest impact magnitude from the domestic land investors (0.6) compared to 0.3 for other

investors. The farm yields, measured by the cereal yields, significantly lead to the deplorable environment because as more yields are harvested there is a tendency to further cultivate the land and other exploration which might reduce the land nutrients and fertility and thereby make the environment deplorable. The magnitude of the deplorability of the environment due to farm yield is more pronounced in the domestic land investment (0.6) than the foreign which is 0.2. Furthermore, the climatic condition, measured by precipitation, significantly did not make the large-scale land investment at this margin to be environment degradable. The more the precipitation the higher environment sustainability by all categories of large-scale land investors. The institutions are significant and tend to protect the environment for sustainable land utilization. The business regulatory environment indicates that despite the inadequate institutional capacity in Africa, contract enforcement and land governance is such that sustainable land use and environmental protection is ensured.

THE SUMMARY AND CONCLUSION

The paucity of literature that has empirically investigate the impact of large-scale land investments on environmental sustainability motivates this study. The results suggest that the activities of large-scale land investors impacted adversely on the environment. The study further finds that at the decision to invest (extensive margin), there is the tendency that the environment gets more deplorable. At the actual large-scale land investment level (intensive margin), the foreign large-scale land investments have adverse effects on the environment but they maintain sustainable use of the land, while the domestic large-scale investment negatively impacted on both the environment and the sustainable land use. Climate change impeded the availability of large-scale land, especially for agri-food production and other land uses such as forestry, conservation, renewable energy and tourism. Thus, this study concludes that large-scale land deals as being obtained in Africa are not environmental friendly. The investors need to adopt international best practices and standards in the implementation of their economic activities to use the land sustainably and not degrade the land.

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