FOREIGN DIRECT INVESTMENT AND ENVIRONMENTAL SUSTAINABILITY OF AGRICULTURAL HOLDINGS IN CAMEROON

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Abstract:
This paper aims to assess the effects of agricultural Foreign Direct Investments (FDI) on the sustainable development of agricultural holdings in Cameroon. The data used are secondary data from the World Bank, the WGI, and the INS, namely the Balance of Payment of Cameroon (BP). The study period is from 1977 to 2018. An environmental performance index measures environmental sustainability. In addition, we use the Co-integration model of Engle and Granger for the case of time series as a methodological tool for secondary data. The estimation results of the model show that environmental pollution evolves according to the entry of FDI in the agricultural sector in Cameroon. Thus, the pollution haven hypothesis is verified in Cameroon. Therefore, we propose that the negative impacts of FDI on the sustainable development of agricultural holdings in Cameroon be seriously controlled.

Keywords: agriculture, sustainability, agricultural Holdings, foreign direct investment, Cameroon.

1. Introduction

Agriculture is one of Cameroon's main pillars of growth and will remain so for many years to come. However, with environmental degradation, loss of biodiversity, and climate change all impacting the productivity of this agriculture,

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there is reason to question its sustainability (World Bank, 2020). However, in the face of agricultural technology and climatic constraints in developing countries, food production in these countries is insufficient and requires many agricultural investments (Morea and Balzarini, 2018). However, in the face of challenges related to population growth, the agricultural sector must nevertheless be able to respond sustainably to the nutritional needs of populations by preserving natural resources and promoting long-term economic development.

In Cameroon, agricultural holdings (palm oil agro-industries, rubber plantations, sugar cane, cotton, etc.) are increasingly new niches for multinational firms (Karlsson, 2015). Agricultural activity certainly has negative effects on the environment, but the fact remains that FDI in the direction of developing countries is not without consequences on the environment. The economic literature shows that, in the face of globalization, we are witnessing a relocation of polluting firms from countries with strict environmental regulations (countries of the North) to those with lax environmental regulations (countries of the South). This refers to the pollution haven hypothesis. However, with the degradation of the ozone layer, one wonders about the effect of the activities of these firms on the environment of the host countries. The goal is to promote sustainable growth in a context where the world economy is moving toward *green* growth.

The development of arguments on the FDI-environment relationship in Cameroon raises questions about the ability of FDI to lead to the environmental sustainability of agricultural enterprises in Cameroon.

The main objective of this study is to assess the effects of FDI on the environmental sustainability of agricultural enterprises in Cameroon and to evaluate the effects of FDI on the environmental performance of agricultural enterprises in Cameroon.

The main research question of this study is: What are the effects of FDI on the environmental sustainability of agricultural enterprises in Cameroon?

2. State of the Art

By highlighting the potential benefits of FDI, among others, as a source of growth in developing countries in Cameroon, it is essential to examine whether this policy conflicts with the environment.

Houngbo (2008), Ngo Nonga (2016) IFDD (2019), and Tisdell et al. (2019), consider that ecological sustainability refers to the ability to reduce pollution, make the best use of the limited stock of natural resources available to allow future generations to meet their natural capital needs.

Sustainable agriculture is an application of sustainability to the agricultural sector. Sustainable agriculture has multiple definitions in the scientific and lay literature. Several studies, including Ngo Nonga (2008), question the sustainability of Cameroonian agriculture. According to Larbodiere et al. (2020), an agricultural enterprise is considered to be ecologically efficient if it produces abundantly by best combining the scarce natural resources at its disposal in such a way as to preserve the environment. In this framework, we will discuss about the environmental sustainability of agricultural holdings.

Faced with the need to promote economic growth in Cameroon, there is a need to move from conventional to industrial agriculture and this last category of agriculture requires significant financial resources. However, many developing

countries (DCs) have a limited financial capacity to fill their investment gaps (Mhlanga et al., 2009). According to Ngo Nonga et al. (2015); Sossou et al. (2017), and Dontsi (2020), this situation is worrying so that loans issued by commercial banks in favor of the agricultural sector still represent less than 10% of loans in Sub-Saharan Africa (SSA), and loans from microfinance are generally too low and poorly adapted to capital formation in agriculture.

Therefore, in general, and in Sub-Saharan Africa, developing countries must have access to foreign funding (ODA, FDI, etc.). However, as Karlsson (2015) noted, the probability that international organizations will finance the investment needs of the agricultural sector is very low. In this context, Foreign Direct Investment (FDI) can present itself as an opportune source of financing for the modernization of agriculture in Cameroon. Moreover, previous studies have shown that FDI significantly influences agricultural production (Burlea-Schiopoiu et al., 2021; Dhahri and Omri, 2020).

Theoretically, is controversy over the impacts of FDI on the environment. On the one hand, we have the arguments of ecologists based on a pessimistic *winner-loser* scenario (Sandbach, 1978; Javorcik and Wei, 2001; Copeland and Taylor, 2004; Rendall, 2019). According to this school of thought, faced with the difference in environmental regulations that exist between the countries of the North and those of the South, we are witnessing a displacement of polluting firms (FDI) from countries with strict environmental regulations (countries of the North) towards countries with lax environmental regulations (countries of the South) generally developing countries.

This theory is known in the literature as the pollution haven hypothesis and we also have the arguments of free traders who base their analyzes on the optimistic *winner-winner* scenario (Porter, 1991 and Porter and Van Der Linde, 1995). According to this line of thought, FDI activity could lead to high levels of income/headship which can subsequently stimulate greater levels of environmental preservation. This can be linked to a number of factors such as: consumer demand for products that meet environmental standards; improving production processes; product differentiation (certifications); and technological innovations.

The study of the link between agricultural foreign direct investment and the environment has caused much ink to flow. As a result, many empirical studies have focused on analyzing the link between agricultural foreign direct investment and air pollution in various countries and regions of the world.

According to Christoforidis and Katrakilidis (2021), the question of the effects of FDI on the environment of host countries is much debated in the literature (e.g., Baek, 2016, Jambor and Leitao, 2017, Shahbaz et al., 2018).

The role of FDI on sustainability is debatable and remains controversial across the world with conflicting empirical results. Indeed, many studies have provided theoretical justification for the impact of IDF (Lucas, 1988; Romer, 1986, 1993).

The majority of empirical studies on the effects of FDI on the environment have largely focused on the macro aspects of the link between FDI and certain pollutants using aggregated variables at the national levels of developing countries (Mignamissi, 2017). According to Pazienza (2015), minor attention has been paid to studying this relationship in a specific way, by sectors of activity. Thus, this paper aims to contribute to the understanding of this link by taking into account the agricultural sector in Cameroon. In fact, there is very little information on the

parameters that determine the effects of agricultural FDI on the environment in Cameroon.

Cameroon benefits from significant flows of foreign direct investment, particularly Chinese, which are oriented towards the agricultural sector, and towards the agricultural sub-sector of farms or towards agro-industry. However, farms and agro-industries are heavy consumers of environmental resources, so much so that one of the main sources of greenhouse gas (GHG) emissions in countries happens to be agriculture.

In order to achieve our objective, this study retains the following assumption: Agricultural enterprises under FDI financing led to negative environmental effects in Cameroon. In other words, Cameroon is a haven of pollution for agricultural FDI.

We will first do a theoretical analysis and then an empirical one to test our assumption.

2.1. Theoretical review of the pollution haven hypothesis

Theoretical analysis is a conceptual framework that makes it possible to highlight a certain number of theories justifying the impacts of FDI on the environment, such as:

2.2. Agricultural pollution management theory

FDI can lead to an efficient and faster diffusion of clean technologies, thus leading to better environmental preservation. According to the OECD (2002, p. 19) "The technologies that are transferred to developing countries in connection with foreign direct investment tend to be more modern, and environmentally "cleaner", than what is locally available". Similarly, Porter (1991), Porter and Van der Linde (1995), Burlea-Schiopoiu (2013) and FDI (2022), argue that countries that enforce strict environmental policies could encourage firms to innovate. In this case, these companies will be encouraged to use fewer polluting technologies. This could lead to a reduction in pollution in FDI host countries.

2.3. Kuznets' theory of environmental management

According to neo-classical economists, the solution to environmental problems consists of economic growth (Kuznets, 2015). Indeed, at the beginning of the cycle, we first see an increase in pollution linked to an increase in production. However, from a certain level of development, we see a decrease in pollution through several structural changes such as innovative production techniques, and a decrease in energy consumption. Economic growth leads to a decrease in pollution and consequently to environmental sustainability. Thus, countries with a high level of development pollute less because they can devote part of their income to pollution reduction.

Therefore, after a certain stage of growth, the increase in environmental pollution starts to decrease. Thus, economic growth is accompanied by structural changes that subsequently lead to technological innovations and eventually reduce energy consumption, thus contributing to environmental sustainability. Rich countries would thus be less polluting since they would have the financial means to devote a part to reducing pollution.

2.4. The theory of the pollution haven hypothesis

According to this theory, FDI, by promoting agricultural production, leads to pollution, and due to a difference in the implementation of environmental regulations between the countries of the North and those of the South, the latter would be transformed into a host of polluting activities (Baumol and Oates, 1988,

Rendall, 2019). Thus, developing countries attract pollution-intensive foreign capital that seeks weaker regulations to avoid paying costly pollution fines.

Economic theory related to the pollution haven hypothesis argues that FDI exacerbates environmental pollution in host countries. However, this can be explained by several internal factors in host countries, such as corruption (Assa, 2018), faster economic growth, and quality of environmental regulation (e.g., Christoforidis and Katrakilidis, 2021; Abdouli and Hammami, 2017; Kocak and Sarkgünesi, 2018).

2.5. Kuznets environmental management theory

Starting from the idea that the solution to environmental problems lies simply in economic growth, at the beginning of the cycle, we first witness an increase in pollution linked to increased production (Kuznets, 2015). However, from a certain level of development, pollution is reduced through a certain number of structural changes, such as innovative production techniques, a reduction in energy consumption, etc. This leads to less pollution and, therefore, environmental sustainability. Thus, countries with a high level of development pollute less because they can devote part of their income to reducing pollution.

This means that from a particular stage of growth, the increase in environmental pollution begins to decrease. Thus, economic growth is accompanied by structural changes which subsequently lead to technological innovations and ultimately reduce energy consumption, thus contributing to environmental sustainability. The rich countries would thus be less polluting since they would have sufficient financial means to devote a part to reducing pollution.

The quality of a country's political institutions plays a determining role in the link between FDI and the environment. Therefore, when there is a high degree of corruption in a country, FDIs may try to put pressure on the government by trying to bribe it to influence the environmental regulations in force or by bribing officials to obtain a tax to less pollution.

This set of theories concerning the pollution haven hypothesis will allow us to select our study variables.

3. Methodological Approach

3.1. Sampling and study data

Our study population is composed of agricultural enterprises under FDI financing in Cameroon. The basis of our survey of this sample is made on the companies registered with the chamber of commerce of the industry of Mines and Crafts, of those having subscribed to the Statistical and Fiscal Declaration (SFD) with the National Institute of Statistics (N'guessan, 2019). Those who have indicated in their DSF foreign participation in their share capital or commercial or financial transactions with the outside world. Our secondary data come from the World Bank, the WGI, and the INS, namely the Balance of Payment of Cameroon (BP). Our study period goes from 1977 to 2018.

3.2. Study variables

The dependent variable is the environmental degradation indicator D. This variable is a proxy represented by the *global greenhouse gas emissions* indicator of the agricultural sector measured by: CO2 emissions, methane emissions (Ch4) (agricultural activities, waste management, energy use, combustion of biomass, etc.), emissions of nitrous oxides (N_2O) (agricultural activities and use of fertilizers).

Poore and Nemecek (2018) affirm that this variable was extracted from the FAO database (FAOSTAT database 2018).

The explanatory variables selected from the literature are as follows:

Foreign Direct Agricultural Investments (FDI)

These are the inflows of agricultural FDI as a percentage of GDP in Cameroon (variable of interest) as presented by Chang and Li (2019). This variable is subdivided into two variables, namely IDEAGRI (which are agricultural enterprises under FDI financing) which are generally involved in agricultural production, namely farms and IDEAGROAL (which are agri-food enterprises under FDI financing) which are generally the industries which process agricultural products. The expected sign is positive.

Quality of Environmental Regulation (QUAL REG)

This variable is a determinant of the location decision of agricultural enterprises Christoforidis and Katrakilidis (2021). Insofar as Cameroon is a country classified among the developing countries and therefore has lax environmental regulations.

Corruption (CORUP)

According to Assa (2018), corruption is a factor that can influence the application of environmental policy and even its implementation.

*The multiplicative variable (FDI*QUAL REG)*

This variable allows us to see the combined effect of FDI and environmental regulations.

Gross Domestic Product per capita in the agricultural sector (y)

According to Grossman and Krueger, 1995 this variable represents the sum of the added values generated by agricultural enterprises under FDI financing in Cameroon in constant local currency.

3.3. Analysis model

In order to rigorously test the pollution haven hypothesis, we use econometric modeling borrowed from Grossman and Krueger (1995), who are recognized among the pioneers in this approach. By contextualizing this model, our variable of interest is the ratio of agricultural FDI inflows as a percentage of GDP.

By integrating all our variables, the model to be estimated is the following:

$$D_i = \beta_0 + \beta_1 y_i + \beta_2 y_i^2 + \beta_3 y_i^3 + \beta_4 FDIAGRI_i + \beta_5 FDIAGROAL_i + \beta_6 QUALREG_i + \beta_7 FDI * QUALREG_i + \beta_8 CORUPT_i + \varepsilon_i$$

3.4. Preliminary tests

Following Zheng and Pengfei (2017), we build an explanatory model that allows us to analyze the pollution haven hypothesis. Subsequently, we make several estimates based on the Co-integration method of Engle and Granger (1987) and using the Augmented Dickey-Fuller and Co-integration tests (Cowpertwait and Metcalfe, 2009). Beforehand, we will choose the model that is appropriate to the available data before proceeding to the estimates (table 1).

Table 1. Augmented Dickey-Fuller unit root test

Variables	Level Variables	First Difference	Decision
D	0.310237	-4.919738***	I (1)
CORUP	0.275873	-3.245149**	I (1)
FDI-AGRI	-1.217416	-5.477529***	I (1)
FDI-AGROAL	0.050321	-5.379645***	I (1)
FDI-AGROAL*QUALREG	-0.362465	-6.222069***	I (1)
FDI-AGRI*QUALREG	0.351592	-6.455326***	I (1)
Y	-0.822960	-2.983210***	I (1)
Y^2	-0.288110	-3.260799**	I (1)
Y^3	0.112401	-14.50675***	I (1)
QUALREG	0.255604	-6.942579***	I (1)

Source: Authors

Table 2 show the co-integration test.

Table 2. Co-integration Test

Null Hypothesis: TCE has a unit root **Exogenous: Constant** **Lag Length: 9 (Automatic - based on SIC, maxlag=9)**			
		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-5.134721	0.0003
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	

The unit root test shows that all variables are integrated into order 1. Thus, we can use the Co-integration model of Engle and Granger (1987). Subsequently, the Co-integration test reveals that the residual from the estimation of the long-term relationship is stationary at the level.

4. Results of the estimation of the determinants of environmental degradation in Cameroon

The results of the Augmented Dickey-Fuller and Co-integration tests (Cowpertwait and Metcalfe, 2009) show that the model is globally significant at 1% and explains 68% of the environmental degradation in Cameroon. Furthermore, the Durbin-Watson statistic is around 2, thus implying the non-existence of self-correlation of the residuals. Finally, the series of variables is more than 30 years long, and according to the law of large numbers, this series is normal (Table 3).

Table 3. Long-term relationship or Co-integration model

VARIABLES	D
Y	0.0617 (0.0473)
Y^2	0.045479 (0.017809)
Y^3	0.003419 (0.380731)
FDI-AGRI	0.0104*** (0.0036)
FDI-AGROAL	0.176** (0.0808)
QUALREG	0.183** (0.0781)
CORUP	-0.195** (0.0749)
FDIAGRI*QUALREG	0.137*** (0.0468)
FDIAGRO*QUALREG	0.204** (0.0934)
Constant	0.154 (0.0940)
R-squared $PROB\,\mathrm{f}\quad f$	0.682 0.0000
Durbin-Watson stat Observations	2.047301 42

*Note *** Significance at 1%, ** Significance at 5%, * Significance at 10%.*
Standard errors in parentheses*, $D.X_t$ = differentiated variables*

Our findings prove that almost all the coefficients of the variables are of expected signs except for the square of the gross domestic product per capita (Y^2) and corruption.

Table 4 shows the error correction model and values of variables.

Table 4. Error correction model

VARIABLES	D.D
D. Y	0.00789***
	(0.00278)
D. Y^2	-0.005754
	(-0.326710)
D. Y^3	0.000100
	(0.072068)
D. FDI-AGRI	0.00419***
	(0.00143)
D. FDI-AGROAL	0.00498**
	(0.00184)
D. QUALREG	0.109***
	(0.0388)
D. FDIAGRI*QUALREG	0.00490***
	(0.00176)
D. FDIAGRO*QUALREG	0.00600**
	(0.00227)
D. CORUP	-0.102**
	(0.0398)
L.ECT	-0.446***
	(0.145)
Constant	-0.000638
	(0.00368)
R-squared	0.749
$PROB\,\mathrm{f}\quad f$	0.000000
Durbin-Watson stat	2.003783
Observations	41

*Note *** Significance at 1%, ** Significance at 5%, * Significance at 10%.*
Standard errors in parentheses*, $D.X_t$ = differentiated variables*

The variables FDI-AGRI and FDI-AGROAL contribute significantly to the explanation of environmental pollution in Cameroon, meaning that pollution increases as a function of FDI entering the agricultural sector in Cameroon.

Since the squared gross domestic product per capita is insignificant, this implies that environmental degradation does not decrease as economic growth increases in Cameroon, as Avom (2011) previously found. This result is also explained by the fact that Cameroon would not yet have reached a level of economic development (a level of richness) that would allow it to move to the pollution decrease phase.

The multiplicative variable FDI*QUALREG is positive and significant. One explanation for this result could be that agricultural FDI would contribute to environmental degradation because of Cameroon's weak enforcement of environmental regulations. Furthermore, this result agrees with the result found by

Mignamissi (2017) related to whether Africa is a pollution haven. The theory of the pollution haven hypothesis is thus verified in Cameroon.

Finally, the variable quality of environmental regulation is positive and significant, confirming the previous results. As a result, the quality of environmental regulation plays a key role in explaining environmental degradation in Cameroon.

The strength of recall (the coefficient of the residual variable: TCE) is negative in sign and is significant, confirming the validity of the error correction model. Therefore, the environmental degradation variable adjusts dynamically to its exogenous variables. In other words, over time, GHG emissions evolve as a function of the entry of FDI in the agricultural sector in Cameroon.

5. Conclusions

Our analysis shows that FDI in the agricultural sector of Cameroon contributes to environmental degradation because of the weak enforcement of environmental regulations in Cameroon. Thus, the pollution haven hypothesis is confirmed in the context of Cameroon. As a result, the quality of environmental regulation in Cameroon favors the displacement of polluting firms from countries with strict environmental regulations (Northern countries) to those with weak environmental regulations, namely Cameroon.

We propose that the negative impacts of FDI on the environment be controlled, in particular by improving the quality of Cameroonian institutions and by developing incentives for these foreign investors to carry out environmentally responsible actions, such as the use of less polluting technologies by agricultural companies in their production process.

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