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# Green Supply Chain Management Practices and Firm Characteristics: Evidence from Cameroon

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## Abstract

Since the beginning of the twentieth century, green supply chain management (GSCM) has emerged as a set of managerial practices that integrate environmental issues into supply chain management. The purpose of this study is to investigate the firm characteristics and factors that could affect the use of green practices by the firm in Cameroon. Using the Cameroon Business Climate Survey (BCS) for the year 2016, our analysis shows that there exist substantial differences between the green firms and non-green firms. These differentials include factors such as size and skill workers. We also find some evidence that regulatory framework, skill workers, turnover exporting activities and firm size are consistent variables that influence whether a firm will use green practices in Cameroon.

**Keywords:** GSCM practices, firms, performance, Cameroon

## 1. Introduction

Since the Rio Earth Summit in 1992, sustainability development has become an important issue and a common preoccupation on both national and international levels. The growing importance of this concept is due mainly to the overexploitation of the planet's resources, the continuous degradation of the environment and its consequences on climate change [1].

The concept of sustainability development is generally understood as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs [1]. Elkington [2] has operationalized the concept of sustainability development using the concept of triple bottom line, which integrates economic, environmental and social sustainability.

The integration of sustainability into supply chain management (SCM) has led to the development of the concept of sustainable supply chain management (SSCM), broadly defined by Carter and Rogers as the strategic, transparent integration and achievement of an organization's social, environmental and economic goals in the systemic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its supply chains [3].

When dealing with environmental issues, enterprises and academics refer to green supply chain management (GSCM) that aims to reduce harmful effects to the environment [4, 5]. The GSCM practices include many aspects of SCM as product

design, material sourcing and selection, manufacturing processes, delivery of the final product to consumers as well as the end-of-life management of the product after its useful life.

Today, the issue of GSCM is very important to firms because an increasing number of their customers and businesses are choosing safe and environmentally friendly products when making a purchase decision. Around the world, a growing number of firms have already embodied green elements in their business activities [6, 7]. However, some firms are confronted with various challenges in formulating and implementing their green business strategies [8].

Despite the abundant literature exploring the relationship between business and the environment [4, 9], little research attention has been devoted to the sub-Saharan African cases. Against this background, the aim of this study is to develop the research in the area of GSCM by investigating the characteristics of green firms and factors influencing the adoption of green practices in Cameroon. In particular the study seeks to answer two key questions: What are the characteristics of green firms in Cameroon? What factors are driving Cameroonians' firms to become more green?

The answers on these questions can be useful in order to develop the appropriate GSCM practices and reducing the environmental problems in Cameroon.

The rest of the paper proceeds as follows. The next section presents the short overview of environmental policies in Cameroon. This is followed by a brief review of the literature. The empirical analysis and results are presented in Section 4. Section 5 concludes with a discussion of policy implications.

## **2. Short overview of environmental management policies in Cameroon**

From the biodiversity point of view, Cameroon has one of the richest and most diverse faunas on the African continent and ranks in the fifth rank. The country also owns one of the largest forests in Africa, which cover 22.5 million hectares.

Like other African countries, Cameroon faces many environmental problems: soil degradation and desertification, loss of biodiversity due to deforestation and hunting, industrial pollution and urban management.

Despite the consideration of the environment as a precious asset that must be preserved for present and future generations by the public authorities, it's only after the 1992 Earth Summit that a clear environmental policy is defined in Cameroon. Cameroon has signed the 1992 Convention on Biological Diversity (CBD), which provides the framework for global action on biodiversity. The strategic approach of the CBD to safeguard biodiversity and its benefits is defined by the 2011–2020 Strategic Plan.

The law relating to environment is adopted in 1996. This law encourages the participation of the population in the protection of the environment and leads to the establishment of specialized ministries and institutions. With regard to the institutional mechanism, two ministers are created: the Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED) and the Ministry of Forest and Wildlife (MINFOF). The MINEPDED is responsible for the development, implementation and assessment of the government's policy on the environment, nature protection and sustainable development. The MINEPDED has been entrusted with the implementation of the National Environmental Management Plan (PNGE), a general framework of reference for the various sectoral environmental management actions in Cameroon.

The MINFOF plays a leading role in the fight against climate change is the Ministry of Forest and Wildlife. For this aim, the MINFOF has developed the

National Observatory on Climate Change (ONACC) and the National Forest Development Plan (PNDF) and the National Agency for Forest Development Support (ANAFOR). The ONACC's missions are to monitor and evaluate the socio-economic and environmental impacts of climate change and to propose preventive measures, mitigation and/or adaptation to the adverse effects and risks associated with these changes. The PNDP includes measures to reduce emissions from deforestation and forest degradation. The ANAFOR's role is to regenerate the forests.

Thanks to the ONACC's actions, thousands of hectares of Cameroon's forests are now classified as "protected areas", which allows them to be preserved and, at the same time, to reduce related emissions.

From the business point of view, the environmental law contains the incentive measures to promote the ecologically innovative firms and sanctions. For example, Article 76 of the law relating to the environment states that the industrial establishments importing equipment enable them to eliminate greenhouse gases like carbon dioxide and chlorofluorocarbons, in their manufacturing process or their products, or to reduce any form of pollution benefit from a reduction of custom duty on these equipment. Private individual and corporate bodies promoting the environment shall benefit from a deduction on taxable profit.

### **3. GSCM practices and firm characteristics: what does the literature says?**

Extensive literature reviews can be found in [4, 5, 10, 11]. We summarize briefly the typology of GSCM practices and discuss the empirical studies.

According Azevedo et al. [12], the GSCM practices can be defined as any action performed across the supply chain, either within the company or involving external partners, to eliminate or reduce any kind of negative environmental impact. In this view, the "green enterprises" are those which contribute to preserving or restoring environmental quality, protect ecosystems and biodiversity and operate in a way that solves rather than causes environmental problems [7]. These enterprises also reduce energy, material and water consumption through high-efficiency strategies.

Within the literature, there are several factors that motivate firms to adopt GSCM practices or to go "green" [5, 9, 13–15]. These factors can be grouped in two strands: the internal factors and external factors [7, 10].

#### **3.1 The external factors**

The external factors are highlighted by the institutional theory and supply chain models [16].

According to the institutional theory, there is a connection between GSCM practices in an organization and external forces, such as regulatory systems, market characteristics, communities and environmental interest groups and industry associations [17, 18]. The government rules through incentives and sanctions motivate firms to apply the green practices in their supply chain. In the same vein, the pressures exerted by the competitors' and the consumers' sanctions (boycotting) do indeed enhance environmental management practices in many firms [10].

In the supply chain models, the diffusion of environmental practices can be also explained with reference to the existence of power asymmetries within the supply chain [19]. In fact, the governance into supply chain is characterized by the authority and power relationships between firms. Thus, firms with strong bargaining power in the supply chain can exercise control over weaker parties and impose some [20, 21].

Empirically, many studies confirm the positive effect of the external factors on GSCM practices. For example, Liu et al. [22] find, in the case of construction sector, that the incentives from the government appear to be the main motivation for the use of green practices. Simpson and Power [23] also find that collaboration between the buyer and the supplier to achieve environmental management goals is potentially an effective way for a customer to introduce environmental performance requirements, environmental innovation activity and environmentally sound process technologies into the supply chain.

Gimenez and Sierra [24] find that the higher the level of implementation of environmental monitoring and collaboration, the higher the environmental performance.

### **3.2 The internal factors**

The theory of transaction cost economics (TCE) and the resource-based view (RBV) theory can be used to explain how internal characteristics of the firms (management structure, governance and firm resources) influence their ability to be “green” [6, 25].

According to the TCE, the information costs associated with learning about new technologies, ideas and competitive landscapes and even determining the costs of acquiring competency in a given arena can impact the ability of the firms to adopt the environmental practices [26].

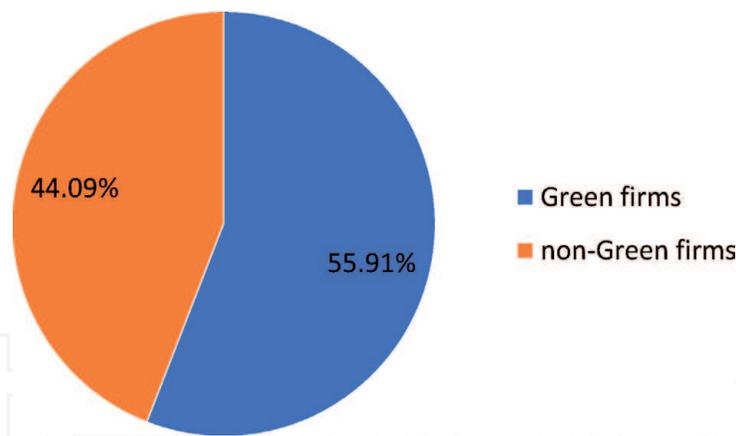
The resource-based view developed by Wernerfelt [27] perceived a firm as a broader set of resources compared to the traditional view which accounts only for categories such as labour, capital and land. The resources a firm possesses can provide a source of competitive advantage [28]. As Leonidou et al. [10] show, many firms can develop a reluctant attitude to environmental issues, mainly because of: (a) The high level of uncertainty involved in introducing diverse programs and activities that are beyond their conventional range of activities; (b) The large financial investments required for various environmental programs and the relatively long time that has to elapse for them to yield a satisfactory return; (c) The high complexity associated with the need to coordinate all functional areas within the organization, as well as to collaborate with the different members of the supply chain; (d) The lack of technical expertise, which is needed to introduce green-related technologies and processes; (e) The absence of an appropriate organizational structure and culture.

On the base of these two theories, Leonidou et al. [29] found that the possession of sufficient physical and financial resources is vital in designing and implementing effective green marketing strategies, although no significant impact was observed with regard to experiential resources.

Marcus and Geffen [30] found that the firm’s internal capabilities (e.g. organizational learning and searching for outside talent, technology and ideas) can help to acquire external capabilities, which in turn are conducive in improving environmental performance. Palmer and Truong [31] show that the relationship between technological green product introduction and firm profitability is positive.

## **4. Green practices and firm characteristics: what does firm-level evidence show?**

In this section we present, firstly, the detailed findings, organized in terms of firm characteristics and their green practices. Secondly by time, we regress



**Figure 1.**  
*Repartition of firms by status. Source: Author, based on BCS database.*

the characteristics of firms on green practice variable in order to determine the firm characteristics that could influence the probability of the firms to use green practices.

The analysis is based on the firm-level microdata gathered by the Cameroon Business Climate Survey (BCS) 2016. The BCS database contains information of about 1585 enterprises from the ten regions of Cameroon. The dataset comprises of details on firm characteristics (firm size, firm age, legal status, industry), sales and supplies, capacity, business environment, etc.

**Figure 1** presents the distribution of firms depending on the status (green or non-green firms). The green firms are those which adopt green (or environmental) practices.

A proportion of 55.91% of firms claim to have a green policy. This includes green practices such as reducing of carbon footprint, reducing and recycling waste, better office energy efficiency, the use of environmentally friendly materials and equipment, the implementation of a green training program for all employees, etc.

**Figure 2** shows the spatial repartition of green firm in Cameroon and the distribution of green firms by size. Yaounde and centre and littoral regions appear to be less green (**Figure 2a**).

Green firms are concentrated in the regions where rural activities are dominant: Sud, Sud-Ouest and Est. According to the firm size<sup>1</sup>, green firms are essentially large firms (**Figure 2b**). As documented in the literature, larger firms have the capacities in terms of skill, human and financial resources to invest in green measures and environmental innovations [7].

Sectoral and industry-wise categorization depicted in **Figure 3a** indicates that the primary sector has higher number of green firm than secondary and tertiary sectors. We also see that wood industry and services have higher number of green firms than others (**Figure 3b**).

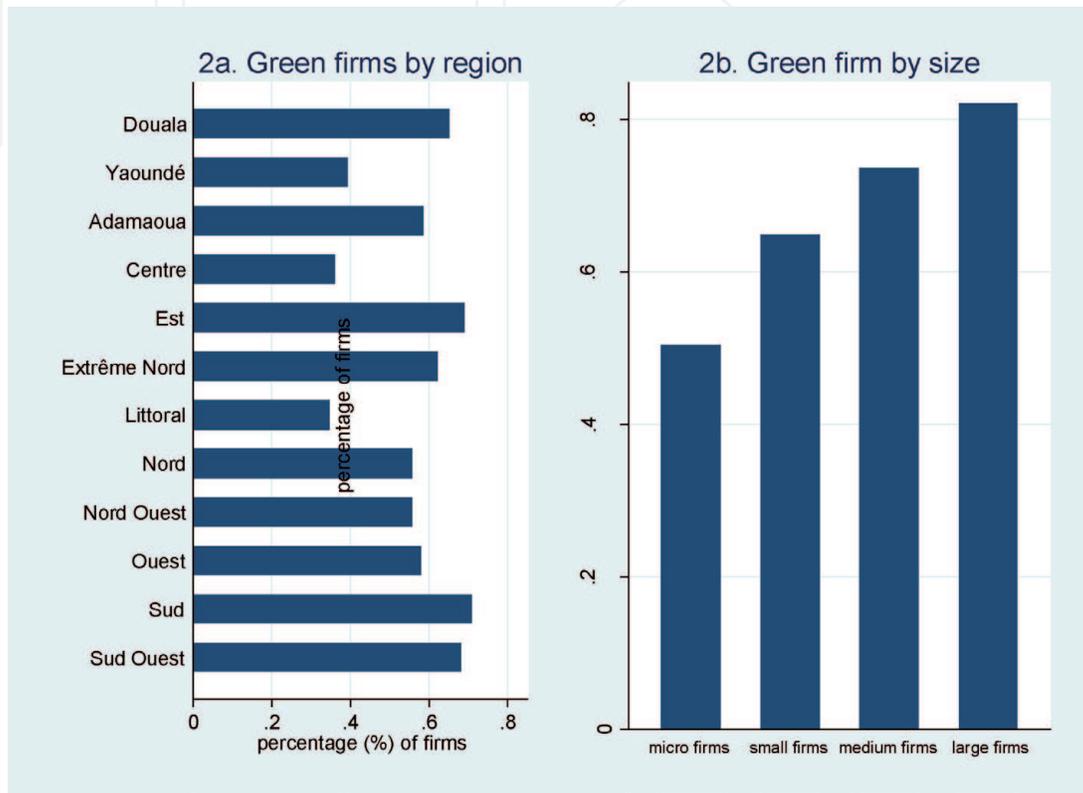
The data also shows that the green firms are those which have high number of skill workers (**Figure 4**).

However, with the descriptive analyses conducted so far, it is impossible to determine the main characteristics which influence firms to adopt green practices. To address this issue, we conduct a regression analysis that allows us to assess how changing one factor influences the probability of a firm to be “green”. We apply a simple probit model:

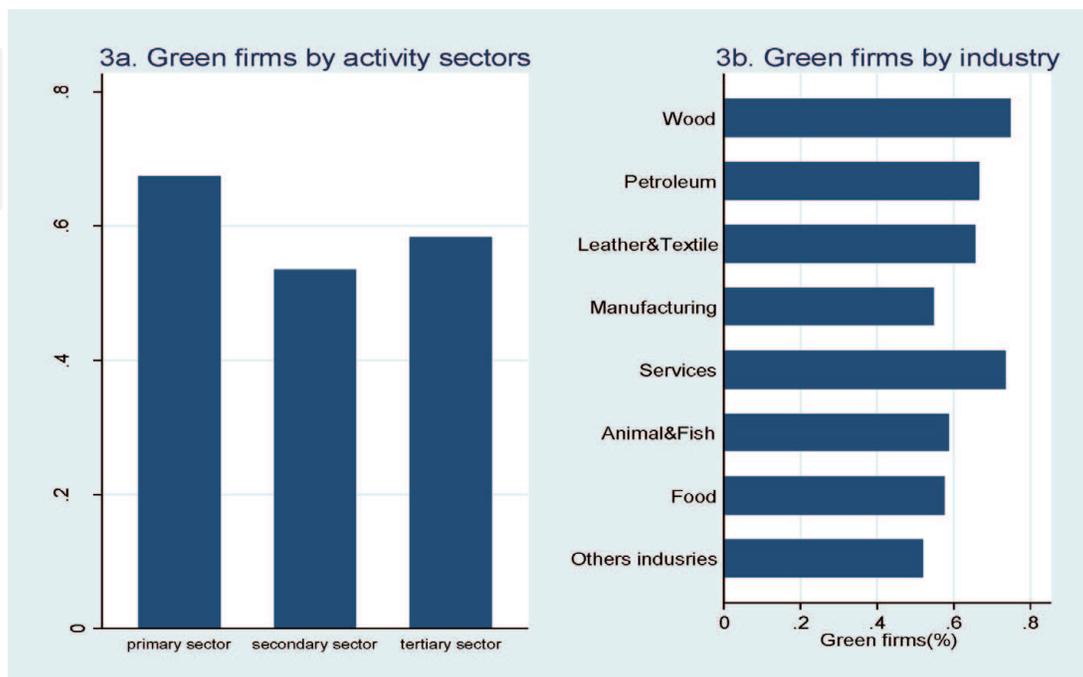
<sup>1</sup> The firm size is a function of number of permanent workers. Micro firms with employees <11; small firms with 11–50 employees; medium firms with 51–250 employees; large firms with employees >250.

$$pr(GSCMp=1) = \left( \beta_0 + \beta_1 \text{legislation} + \beta_2 \text{turnover} + \beta_3 \text{skill} + \beta_4 \text{export} + \sum_{i=5}^8 \beta_i \text{firm size} \right) + \varepsilon_i,$$

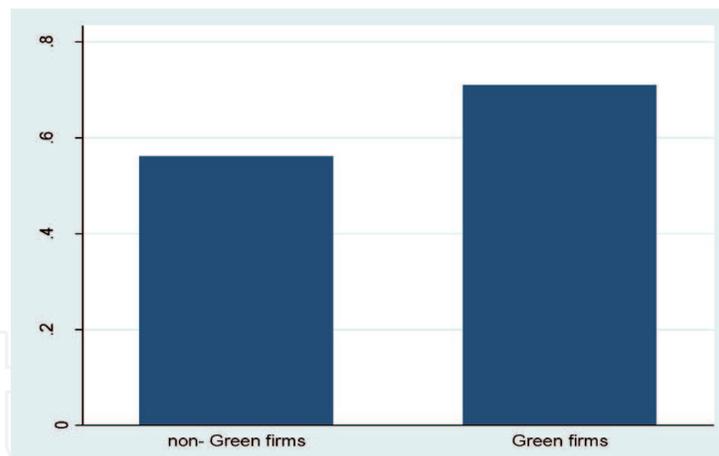
where the dependent variable “GSCMp” is set equal to 1 whenever the firm adopts green practices and 0 otherwise. As we mentioned above, the factors we consider to be relevant for the likelihood of a firm to be green are as follows.



**Figure 2.** Green firm by regions and size of the firms. Source: Author, based on BCS database.



**Figure 3.** Green firms by sector and industry. Source: Author, based on BCS database.



**Figure 4.**  
 Skill workers. Source: Author, based on BCS database.

First, we add an external factor of green practices as legislation. Second, we add the internal characteristics of the firms: turnover, skill workers, export (equal to 1 if the firm export and 0 otherwise) and firm size (four dummy variables, ranging from micro firms to large firms).

The detailed results are presented in **Table 1**. All the estimations are corrected for the heteroskedasticity. The results show that the external force such as legislation increases the likelihood of the firm to adopt green practices (Eq. (3)). These results are in line with the institutional theory, in which the regulatory framework governs a wide range of environmental issues, is usually associated with coercive measures and motivates firms to apply the green practices [16, 24, 32]. Gottberg et al. [33] also found that regulations and external stakeholders exert pressure on corporations to adopt GSCM practices.

The results also show that the internal factors such as skill workers, turnover and the export activity affect positively the probability to be green (Eq. (2)).

This result confirms the analysis of Leonidou et al. [29] who prove and found that the firm's internal capabilities (financial and human resources) are vital in designing and implementing effective green marketing strategies. Some green practices are quite costly to implement. Another important result is the export

	Eq. (1)	Eq. (2)	Eq. (3)
Legislation	0.317 (0.072)***	0.242 (0.074)***	0.242 (0.074)***
Skill workers		0.361 (0.071)***	0.336 (0.071)***
Turnover		0.026 (0.010)***	
Exporter		0.275 (0.130)**	
Small firm			0.340 (0.080)***
Medium firms			0.588 (0.154)***
Large firms			0.879 (0.286)***
Constant	0.052 (0.040)	-0.638 (0.178)***	-0.269 (0.061)***
Pseudo R <sup>2</sup>	0.0097	0.0318	0.0420
Observations	1463.00	1439.00	1463.00

Note: The notations \*  $p < 0.1$ , \*\*  $p < 0.05$  and \*\*\*  $p < 0.01$  denote significance at 10, 5 and 1% levels, respectively. The standard error in parenthesis is clustering on country.

**Table 1.**  
 Estimation results.

activity of the firm. The exportation increases the probability for the firms to adopt green practices. According to the learning-by-exporting hypothesis [34], exporting makes firms more productive. Firms that participate in foreign markets may acquire information from foreign customers and foreign contacts, who may suggest ways to improve the manufacturing process and new product designs and increase the quality of the goods. Exportation can benefit from an entirely green supply chain through cooperation with suppliers on green production technology and exchanging green information with them.

Finally, the size of firm influences positively whether the probability of firm to adopt green practices (Eq. (3)). Compare to large firms, small firms possess limited financial, human, technical and other resources that prevent them from undertaking environmental initiatives and implement proactive green strategies [10]. Larger firms have more incentives to use green practices.

## 5. Conclusion

In this study, we tried to identify whether there is a profile that differentiates green from non-green firms and determine the factors influencing the adoption of green practices in Cameroon. First, we used descriptive analysis and came to a conclusion that there exist substantial differences between the two groups of firms. These differentials include factors such as size and skill.

Second, we used econometric analysis to investigate the firm characteristics that influence the probability that firms adopt the green practices. We find some evidence that regulatory framework, skill workers, turnover exporting activities and firm size are consistent variables that influence whether a firm will use green practices.

The policy implications of our results for Cameroon are many. Since GSCM practices are connected to firm's size, it might be helpful if environmental policies give more incentives to small firms to use green practices.

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