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Impact of Research on Development in Cameroon: convergence between supply and research needs in the food sector

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ABSTRACT

The study analyse the convergence of research priorities to development issues especially from the agricultural and food sector in terms of environmental protection and improvement of the business climate, due to weak institutional interconnection devices. Two types of data are used: bibliometric data and a survey of enterprises. Altogether, 1214 and 1708 bibliographic references were generated from WoS and Scopus respectively (from a total of 9146 and 10 557 publications) in Agriculture, Food and Environment for the period 1991-2015 subject to the condition that the author or at least one of the authors is affiliated to an institution based in Cameroon. A total of 317 agro-food companies were identified from the National Institute enterprise's census. The overall message is a relative weak convergence between development priorities identified from perceptions over agricultural and food companies and research works expressed in the scientific literature. This reflects the weak link between research institutions (universities, research centers) and professional milieus that shape entrepreneurship (firms, policy makers) for guidance of scientific production

INTRODUCTION

The renewal of research policies is at the center of political agendas (national, regional ...) to mobilize the economics of knowledge as a lever to reduce technological inequalities and development. In the Least Developed Countries (LDCs) where the ratio of public research investment out of GNP is generally less than 0.4, this renewal is questioned by the inadequacy of conventional indicators of performance evaluation of science and technology (Rafols and al 2015). used in industrial countries. Indeed, these indicators compare national research systems across different variables.

One of the structuring research questions posed by the literature on the conditions of the emergence of national innovation systems in developing countries ((Lundvall, 2014, Touzard and al. 2015, Temple and al. 2016) is to understand how the supply of scientific knowledge meets the demands of the business sector or civil society.

We propose to answer by analyzing the convergence of research priorities to development issues detected from the agricultural and food sector in developing countries, like Cameroon. The assumption is that of a weak convergence between the research outcomes and enterprise

development stakes particularly in terms of environmental protection and improvement of the business climate, due to weak institutional interconnection devices.

METHODOLOGICAL APPROACH

We analyze how research supply meets demand using descriptive statistics and bibliometric from a framework formalized by Sarewitz and Pielke (2007) and McNie, (2007).

The demand for research is approximated by the needs and research priorities indicators empirically developed from indirect responses of agricultural and food business managers.

The supply for research, in turn, is measured by the relevance of scientific publications produced in the fields of Agriculture and Food and Environment (AFE) by academics, researchers, research centers and other institutions in Cameroon, and international. The topics of interest are identified by keywords: "agriculture", "food" and "environment". Since information on patents were not available, these ones have not been retained.

The convergence assessment procedure is done in two steps.

Firstly, we determine the indicators of the relevance of topics addressed in scientific production regarding the improvement of the business climate and the environmental protection. Thematic relevance levels are estimated by VOSviewer from the frequency of occurrence of certain terms in a sufficiently large number of documents. For this, bibliometric analysis examined the titles and abstracts of publications.

The interest on environmental protection and improvement of the business climate is justified in terms of their presumed impact on the development of developing countries. On one hand, the international agenda post 2015 development gives primary attention to the adaptability of production systems over environmental issues (climate change, pollution, natural resource protection, energy transition) that now appear imperative for any country. Moreover, the Strategic Document for Growth and Employment (SDGE) of the Cameroonian Government and various studies by the World Bank set the improvement of the business climate as a prerequisite for development of industries and economic emergence.

In the second step, we examine the correlation between the relevance of the scientific production and business needs. For this, we meet successively the thematic relevance levels associated with improvement of the business climate and environmental protection with indicators of research needs measured in the companies.

The measure of research needs indicators detected from companies is based on the calculation of scores of thematic related to the improvement of business climate on one hand and to the percentages of firm's decisions to invest in the protection of a given environment thematic on the other hand. As for the prioritization by the scores, the arbitrary values are assigned (3, 2.5, 2, 1.5 and 1) in descending order with which each company manager identifies five main themes that constitute barriers to improving the business climate: the sum of the scores for each thematic gives its accorded priority.

The various business climate and environment protection themes are represented graphically. The x-axis and y-axis respectively indicate the levels of relevance and research needs indicator on thematic. It is thus to assess to what extent the relevance of the theme of the "supply for research" is correlated or not to the indicators of "needs or research priorities of

firms." A line of 45 °, dividing the graph into two equal parts is the perfect alignment between research activity and the alleged priorities of research enterprises.

Two types of data are used: bibliometric data and a survey of enterprises. Bibliometric data is gotten from Web of Science (WoS) and Scopus from the Thomson Reuters and Elsevier publishing companies respectively; these two being the main sources of scientific information in the world (Guz & Rushchitsky, 2009). These data serve as proxy for research activity in Cameroon. Data on scientific research output in AFE is collected for the period 1991-2015 subject to the condition that the author or at least one of the authors is affiliated to an institution based in Cameroon (with a valid address as well). In the search of databases, we focus only on *articles* and *reviews* and fine-tune the search using key words such as *agriculture*, *agronomy*, *food*, *nutrition* or *environment*.

Table 1. Scientific publications in AFE in Cameroon from 1991 to 2015

Types of documents	WoS		Scopus	
	Quantity	Percentage (%)	Quantity	Percentage (%)
Articles	1163	95,8	1618	94,7
Reviews	51	4,2	90	5,3
Total	1214	100	1708	100

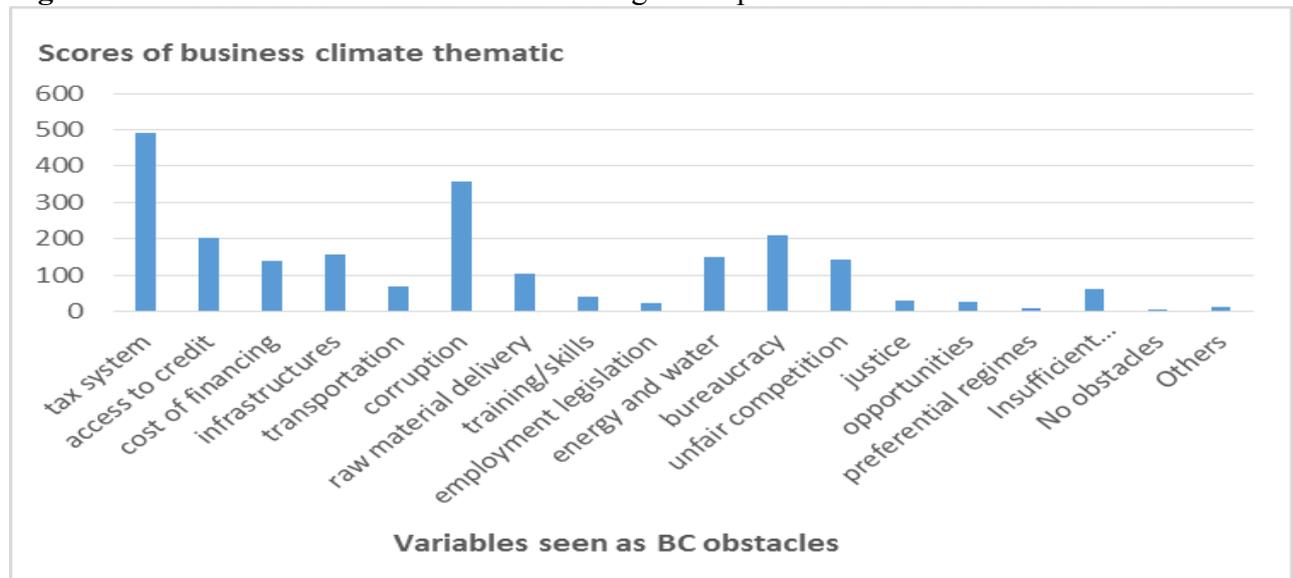
Source: WoS and Scopus data. Construction by authors.

Survey information on enterprises is gotten from the general census of enterprises conducted by the National Institute of Statistics in 2008. A total of 317 agro-food companies were identified

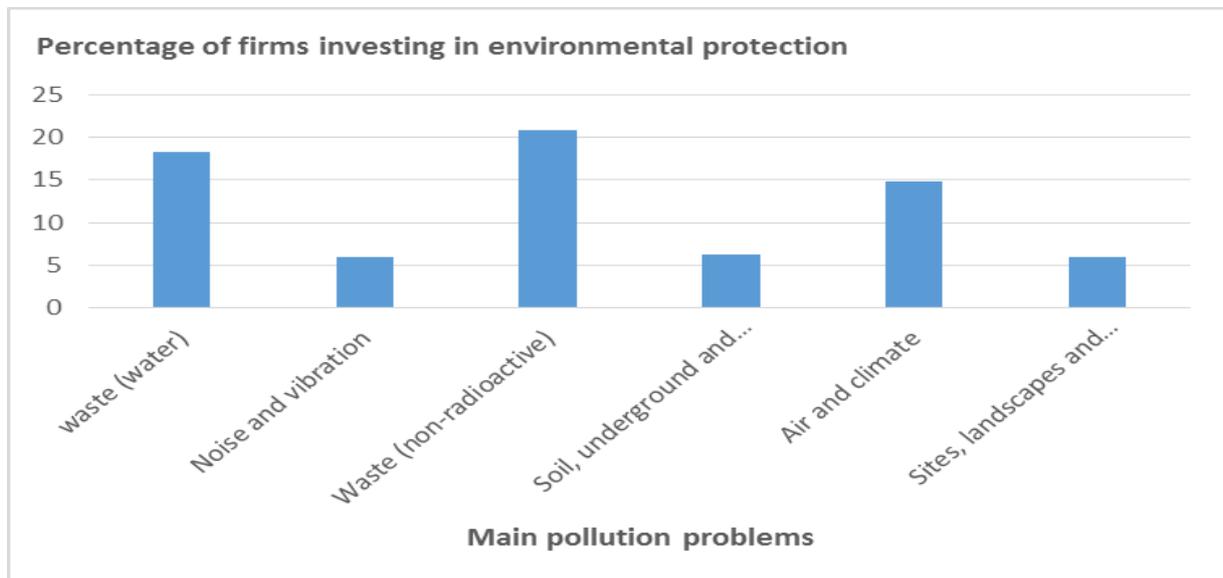
RESULTS AND RECOMMENDATIONS

The needs of research perceived from agricultural and food companies on themes concerning the improvement of the business climate and environmental protection are represented by figure 1a and 1b. It shows relatively high scores associated with tax system, corruption, bureaucracy and access to credit and attesting to their high importance for agricultural and food managers. These are the variables that can be seen as obstacles and could relatively either damage or improve the business environment in Cameroon. Other variables have a relatively low importance.

Figure 1a. Indicators of firm’s thematic affecting the improvement of the business climate



Source: RGE 2008 (INS). Construction by authors.

Figure 1b. Indicators of firm's thematic related to environmental protection

Source: RGE 2008 (NIS). Construction by authors.

Concerning environmental protection, only slightly over 20% of companies formally declare investment on topics associated with it. Investment decisions essentially focus on waste management (non-radioactive), recycling of (water) waste and commitments made for the preservation of air and climate.

Regarding the supply for research, publications on AFE (*articles* and *reviews*) contributed 13.3% and 16.2% of all national publication supply respectively in WoS and Scopus. We can see that over the period studied, AFE publications do increase in absolute values, but relatively lower when reporting them to all publications in Cameroon (figure 2a).

Figure 2a. Evolution of publications in AFE

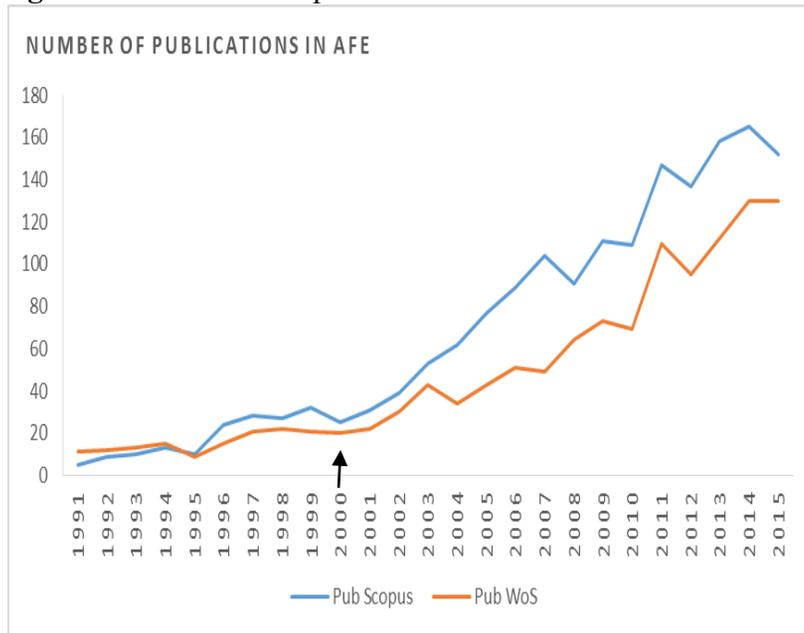
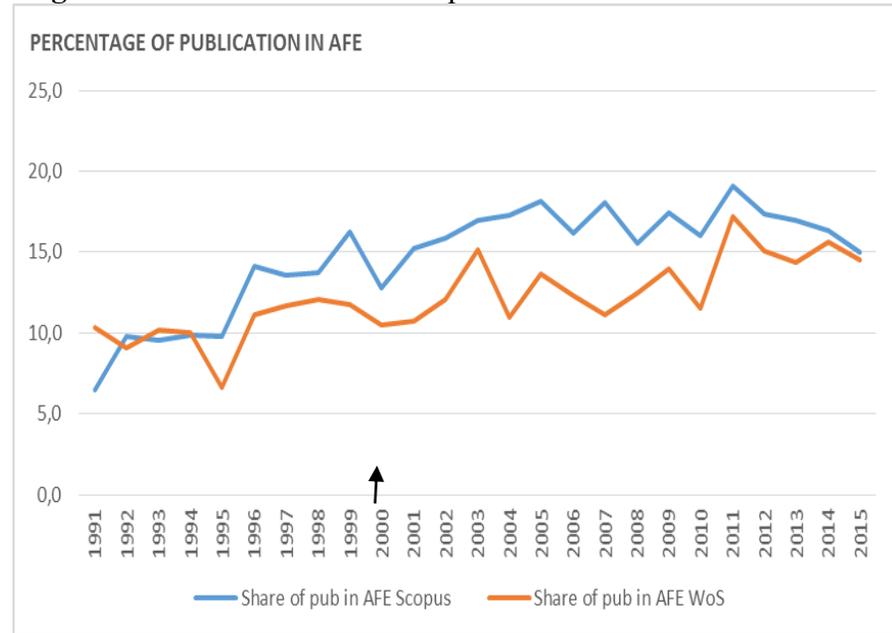


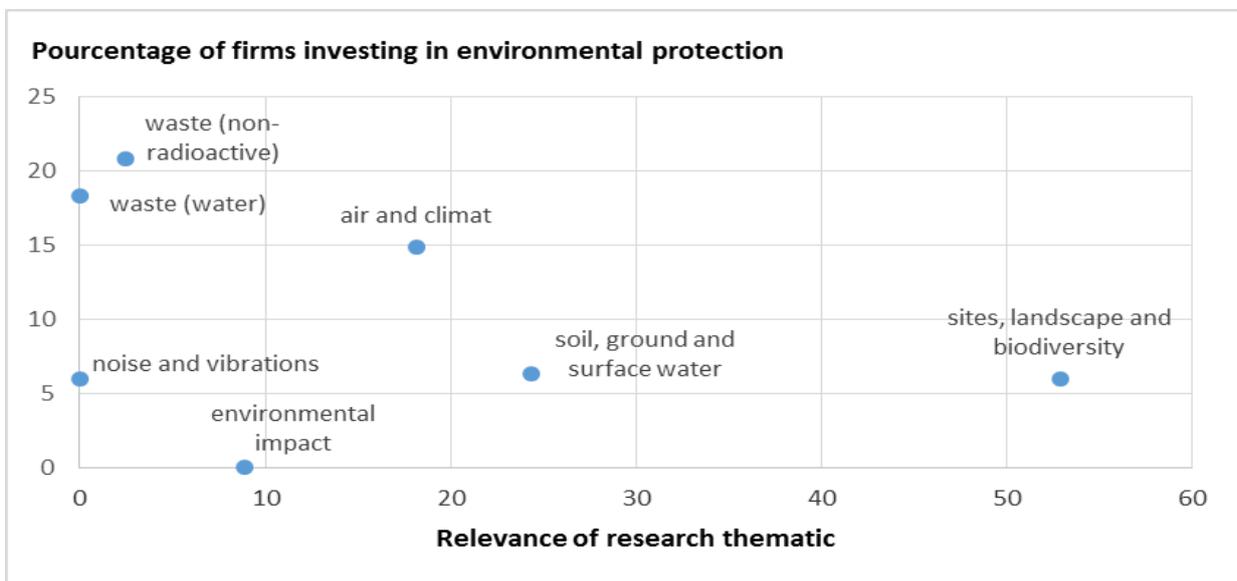
Figure 2b. Evolution of share of publications in AFE



Source: WoS and Scopus data. Construction by authors

It emerges that the balance between the assessment of environmental issues identified by the firms and prevalence of environmental issues addressed by the authors is relatively slim (figure 3). Indeed, if *non-radioactive waste* concerns a relatively large number of companies, this theme and associated expressions have relatively low relevance in scientific studies in Cameroonian production. Contrarily, research topics on *sites, landscapes and biodiversity* have a relatively high pertinent occurrence contrasting however with relatively low perceived importance of these issues at the firm level. It turns out that even some research, especially on the environmental impact, do not arouse the attention of firms, while those that they would be relatively adequate, such as *waste (water)* or *noise and vibrations* are not addressed in the scientific literature. Nevertheless efforts of connection between researchers and companies seem to settle on aspects concerning *air and climate*, and *soil, ground and surface water*.

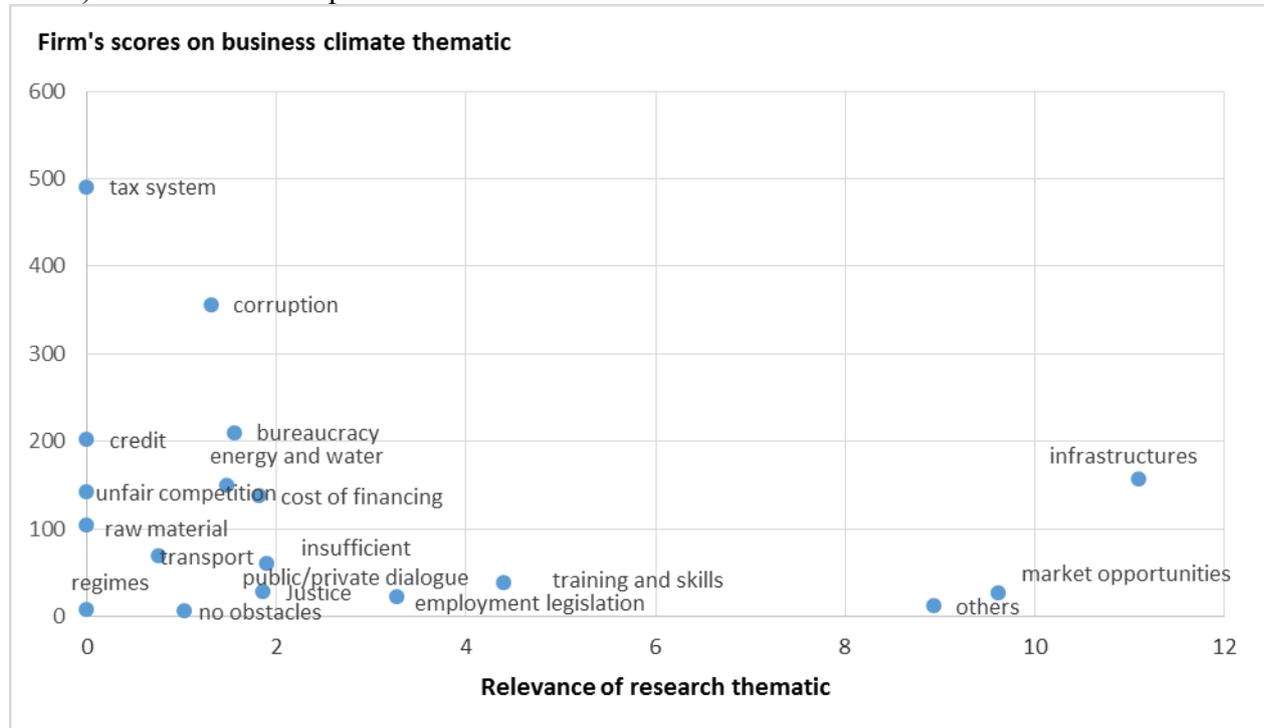
Figure 3. Convergence between supply (thematic relevance) and demand (percentage of investing firms) for research on environmental protection in Cameroon



Source: WoS. Construction by authors.

With respect to variables affecting the improvement of the business climate, the disconnection between the business community and the researchers is striking (figure 4). For example, on important topics such as the tax system, corruption, access to credit, bureaucracy and *water and energy*, scientific work is little or irrelevant. Even the Cameroonian news, especially that relayed by the press and media is quite prolific on these topics. In general, the scientific relevance of indicators are relatively low, as can be noted on important areas of the development process such as *training and skills, infrastructure, and market opportunities*.

Figure 4. Convergence between supply (thematic relevance) and demand (score of firm's needs) for research to improve the business climate in Cameroon



Source: WoS. Construction by authors.

From the previous results, the overall message is a relative weak convergence between development priorities identified from perceptions over agricultural and food companies and research works expressed in the scientific literature. This reflects the weak link between research institutions (universities, research centers) and professional milieus that shape entrepreneurship (firms, policy makers) for guidance of scientific production (Temple and al 2016). One can notice an extension of the effects of a decade of economic recession and liberalization introduced by the implementation of structural adjustment programs (Cassadela et al 2016), which broke the momentum of the whole economic sectors and institutional arrangements for research and dissemination of innovations. The reconstruction is slow and laborious and one of the challenges is to create a balance between the current structuring of the food sector, dominated by many, almost artisanal production units, with a relative lack of research culture, innovation and the orientation of scientific production (Fofiri et al, 2015). The study, however, raises two questions. The first is on the knowledge of the institutional conditions in which works based on bibliometric analysis can better participate in research policy framing and innovation in developing countries in terms of the results they can produce.

The second highlights the limits of our study based on national survey data that identifies industrial enterprises in the formal sector of the economy. With a total of 77,828 jobs in the industrial sector identified by the 331 surveyed companies and a workforce of around 9,000,000, the industry employs in Cameroon less than 1% of the workforce. Most of the entrepreneurial dynamics that harbor the innovation process are assumed in the informal sector that is to say a complex set of production activities and services related to agriculture

and food activities sometimes in extension of the domestic economy. But the needs and accompanying demand for innovation in the informal sector is very little explained by previous and current studies.

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