Incentives and Firms' Productivity: Exploring Multidimensional Fiscal Incentives in a Developing Country

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Abstract

This paper investigates the impact of fiscal incentives on firms' productivity using Cameroonian firms as a case. We use data from the World Bank Enterprise Survey for over 300 firms to calculate the productivity of firms. The Enterprise Survey also contains unique measures of assessing firms' beneficiary status from different categories of fiscal incentives such as import duty exemption, profit tax exemption and export financing. The availability of these measures at the firm level allows us to conduct an impact analysis using the propensity score matching technique. Our results show a significant and positive impact of the productivity of firms that benefit from profit tax exemption and export financing. However, when considering import duty exemption, the significance of this variable was not consistent. The paper thus provides support for the argument that the government's involvement in the firm should be targeted at rewarding outputs and not supporting processes, and thus provides an essential element of a strategy for industrialisation.

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1. Introduction

Industrialisation culminates from the sustenance of the productivity of firms over a period. It implies the value addition on factor input and its efficiency, where additional input should yield more firm output. It is expected that with increasing industrialisation, the cumulative effect be seen in the creation of jobs for sustained growth and economic diversification. More so, industrialisation brings about increased household consumption through improvement in the value of product and price efficiency, and the development of other primary sectors through backward linkages that come with the demand for intermediate goods. Despite these identified benefits, most African countries have relied heavily on primary products as their main export commodity (UNECA, 2013) and the productivity of other sectors (apart from the primary sector- i.e. agriculture) have remained a source of concern to both the policy and research community. For instance, there have been several calls for structural transformation of African economies from low value-added activities and sectors to higher value-addition (IMF, 2012).

To sustain this transformation, some studies have sought to identify appropriate and alternative source of funding (see Gui-Diby and Renard, 2015), focus on improving the institutional structure – in terms of corruption (McArthur and Teal, 2002), as well as encouraging infrastructural development (Arnold, Mattoo and Narciso, 2008; Escribano, Guasch and Pena, 2010). Among the competing explanations for the sustenance of Africa's industrialisation drive, those focusing on public institutions have gathered particular momentum in recent years, suggesting that the reasons why African countries have not been able to enjoy industrialisation, despite the presence of some catalysing factors like FDI, is that the government support is slack and has failed to establish an enabling environment (Gui-Diby and Renard, 2015). This conclusion points directly to the fact that government involvement is a precursor for firms' productivity and sustained industrialisation process in Africa.

An important aspect of government involvement is incentives, either fiscal or non-fiscal. Paying attention to fiscal incentives, they include those fiscal measures that are used by the government to extend some measurable advantages to specific firms or categories of firms (UNCTAD, 2000; Fletcher, 2002). These may be tax holidays, investment allowances and tax credits, reduced corporate income taxes, exemption from indirect taxes and export processing zones. There are arguments explicating the importance of fiscal incentive in improving firms' productivity. Some proponents argue that under certain conditions, they improve investment, create jobs and other socio-economic benefits (Bora, 2002). While the opponents believe that the cost of fiscal incentives (such as deteriorating governance and increasing corruption) outweighs its benefits (see Cleeve, 2008). Our study is situated along the proponents, noting that fiscal incentives can compensate for possible market failures, and can easily be implemented by African governments for achieving their industrialisation drive. Some African countries are already considering this as a viable policy option. For instance, the Nigerian Government has continued over the years to provide some tax incentives to improve investments into various sectors of the economy (Central Bank of Nigeria-CBN, 2013). The Ghanaian Government is involved in granting rebates for corporate income tax of manufacturing firms located in some specific regions of the country, carry-forward losses for up to five years, investment guarantees and exemption of import duties (Action Aid, 2014). Also, South Africa, Cameroon, and a host of others apply specific fiscal incentives.

With the increasing commitment of African political leaders to improve the productivity of investment - via fiscal incentives - it is worthwhile to empirically understand how this action impacts on the

productivity of firms. In this spirit, we investigate how fiscal incentives affect firms' productivity, as well as the distributional impact of these incentives across different categories of fiscal incentives. To achieve this objective, firm level data are gathered from the World Bank Enterprise Surveys, which consists of survey for over 300 manufacturing firms in Cameroon. We use information on firm inputs and outputs to calculate productivity of firms. The enterprise survey also contains unique measures of fiscal incentives such as the benefits from exemptions from duties on imported inputs, benefit from profit tax exemptions, VAT reimbursement, benefits from export financing scheme and benefits from other export/investment incentive scheme. The availability of these measures at the firm level, both as subjective and objective indicators, allows us to exploit the variation in fiscal incentives at the sub-national level across different sectors. Our findings include, among others, that fiscal incentives are beneficial to manufacturing firms in Cameroon; however, the impact varies across the type of fiscal incentive that is observed.

Our inquiry and the resultant findings are important based on the following reasons: first, to our knowledge, there is a lack of econometric studies that analyse the impact of government incentives on firms' productivity, with a special attention to African countries. The closest to our study has focused on how fiscal incentives attract foreign investment to Africa, using macro data analysis (Cleeve, 2008). Arnold, Mattoo and Narciso (2008) attempted to go beyond macro analysis to consider firm-level data, but focused on services inputs. This is way apart from our line of enquiry. At best, there have been policy documents, and with country specific cases, that have emphasised on the importance of fiscal incentives on productivity of firms in Africa. They include the CBN (2013) that focused on Nigeria; the OECD (2007) document that focused, in part, on North African countries; and the IMF (2012) that focused on growth sustenance of African countries. Second, our study complements the growing theoretical and policy literature on the importance of developing countries' government involvement with the private sector by providing incentives that will offset the shortcomings of their business environment (see UNCTAD, 2000; UNCTAD, 2004; Cleeve, 2008; IMF, 2012; UNCTAD, 2015) by applying multidimensional measures of fiscal incentives with a unique empirical application. In particular, apart from considering multidimensional measures of incentives, we apply the impact evaluation methodology which has sparsely been introduced in studies of this nature. This approach is relevant since it goes beyond showing the linear impact of fiscal incentives on firms' productivity, but goes ahead to evaluate what could have been the effect of the introduction of fiscal incentives on firms' productivity assuming they did not benefit from the introduction of the incentives. Third, using Cameroon as a case is relevant and interesting considering that in 2013, the government had a radical shift by enacting the investment incentive law No. 2013/004, which establishes the government's commitment towards creating an enabling investment climate. Furthermore, in many respects, the country is representative for developing economies. Fourth, in the context of developing countries, there has been an aroused interest of African political leaders towards improving the extent of incentives that are given to firms to promote industrialisation, and it would be worth having a critical view on an impact evaluation. Knowing the extent to which these policies promote industrialisation would help to set a direction for a new generation of policies, provided that the political leaders desire to sustain this momentum and move in this direction.

The remainder of the paper is organised as follows: the next session discusses the review of literature, and then the stylised facts are included in the third section. Following immediately is the fourth section that presents an overview of the data used and addresses econometric and methodological issues, while the fifth section is concerned with the descriptive statistics and econometric results. The conclusions of the result are included in the sixth section.

2. Review of Literature

There is a growing interest in improving the productivity of firms in countries. At the micro level, Lee (1996) studied the role of government intervention in enhancing the productivity of manufacturing firms in Korea. The author found that government policies such as tax incentives and subsidized credit were not correlated with total factor productivity of sampled firms. However, he found that government involvement in trade leads to higher productivity. Arnold, Mattoo and Narciso (2008) linked the productivity of firms to service delivery in Africa and concluded that for productivity to be enhanced there is the need to improve the service industries. This is distant from our line of enquiry, although it focuses on productivity. Closely related to our study – but with a divergent focus – is Escribano, Guasch and Pena (2010), who observed that African manufacturing firms will require an improvement in the government commitment to the provision of infrastructure to enhance their productivity.

Some other studies like Ohaka and Agundu (2012) considered the relevance of tax incentive for industrial growth in Nigeria. Their results are of the affirmative that this form of incentive will conscientiously grow critical industries as a result of the productivity impact. Similarly, Mayende (2013) considered the effect of tax incentives on the performance of Ugandan manufacturing firms and found that tax incentive recipient firms tend to have higher performance. Most of the studies highlighted have taken interest in observing the factors that enhance firms' productivity because of the impact of the later on both the economy and development in general.

From the policy perspective, the issue of firms' productivity is of importance. As noted by UNCTAD (2015), the improvement of the productivity of firms is one possible way for developing countries to attain sustainable industrial development. As a result of this, there is an urgent call to relate this phenomenon with the government commitment in providing fiscal incentives to firms that will aid in offsetting some unfavourable conditions in the business environment (see Gui-Diby and Renard, 2015; UNCTAD, 2015). However, the adverse consequence of incentives is apparent (see Cleeve, 2008). In some cases, it is seen as wasteful and propelling corruption due to lack of transparency in its administration. Despite these acclaimed adverse effects from incentives, it is seen as a viable tool for attracting and sustaining investment. As a result, it is suggested that the effectiveness of incentives can be enhanced by conditioning incentives to performance, and directing it towards more development-oriented goals (UNCTAD, 2004). This suggests that not all incentives can enhance a beneficiary firm's productivity. The degree of impact may vary across the type of incentive being observed.

3. Stylized Facts

Fiscal incentives in Cameroon have undergone several regimes with varying focus. In 1990, the investment code in Cameroon was aimed at encouraging and promoting investments in Cameroon by granting financial concessions to firms, such as free transfer of proceeds from investment capital. This act also granted exemption from export duties and other export related expenses, and a rebate from the taxable income of firms involved in the production of finished or semi-finished products for export.

Another important incentive that is granted by the Cameroonian government is the free zone regime, which exempts firms from custom duties and paying of taxes for a period of 10 years of operation. Also, firms in this zone can freely undertake any industrial and commercial activity like installing own power and telecommunication systems, replacing national security scheme with an equal or better valued

private scheme, as well as freely negotiate wages of employees. However, a major drawback of this form of incentive is the precarious condition that for firms to benefit from it, 80 percent of their production must be for foreign consumption – i.e. export (Bureau of Economic and Business Affairs, 2013).

In 2002 a new investment charter was enacted to replace the 1990 investment code. A major improvement of the 2002 investment, way beyond the earlier one in 1990 is that it permits 100 percent foreign equity ownership. This is unlike the 1990 code that had some restrictions on foreign ownership. However, this new charter was not implemented for a long time. In 2013, a new investment incentive law was enacted - law No.2013/004. This law provides two categories of incentives: common incentives and special incentives. The common incentives include those benefits that are given in general to firms to promote their productivity and performance. They include tax and customs incentives such as exemption from registration duties, exemption from transfer taxes, exemption from VAT on different categories of provisions, exemption from business licence tax, direct clearing of equipment and materials related to the investment program, among others.

The special incentives are those forms that involve benefits granted to firms that invest in certain government priority sectors (like the development of integrated Agriculture, real estate development and social housing projects, agro-industry, manufacturing and construction, regional development and decentralisation projects), or to those that promote innovation and export, among others. Some of the incentives that these firms benefit from include: exemption from export duty on locally manufactured products, exemption from custom duties for temporary importation of industrial equipment and materials likely to be re-exported, as well as direct customs clearance at investor's request.

To benefit from any of these incentives, however, some criteria are applicable, which include: the beneficiary firm should be carrying out export activities ranging from 10 to 25 percent of sales, rule of local capacity utilisation, as well as contribution to value addition. Another important aspect of the Cameroonian incentives, just like those of some other developing country, is that it is tied to a period of time. For instance, some of the common incentives are valid for a period of 5 years during the installation stage, and 10 years maximum during the operational stage. With this in place, the government's main intention is to enhance industrialisation and strengthen competitiveness of firms (resident or non-resident) during these key stages of the lifecycle of an investment venture (see Tabi, 2005; Biya, 2013).

Having examined the fiscal incentive regimes in Cameroon, we move on to observe the trend of manufacturing value added, which has been used to access the productivity of the manufacturing sector in macro data analysis (see Dodzin and Vamvakidis, 2004; Kang and Lee, 2011; Gui-Diby and Renard, 2015). An analysis of the trend in Figure 3.1 shows that Cameroon has consistently maintained a manufacturing value added growth rate of no more than 5 percent. This is except for few shocks between 1997 and 2000, where the growth rate increased higher than 5 percent. Compared to the World average that was along the boundary of 5 percent in most of the year[1], Cameroon has not performed poorly in this regard. Likewise, the Sub Saharan Africa (SSA) average was similar to the World average.

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1. The trend for the World average began in 1997. There was no data available for earlier years.

Figure 3.1:   Manufacturing Value Added as a Percentage of GDP
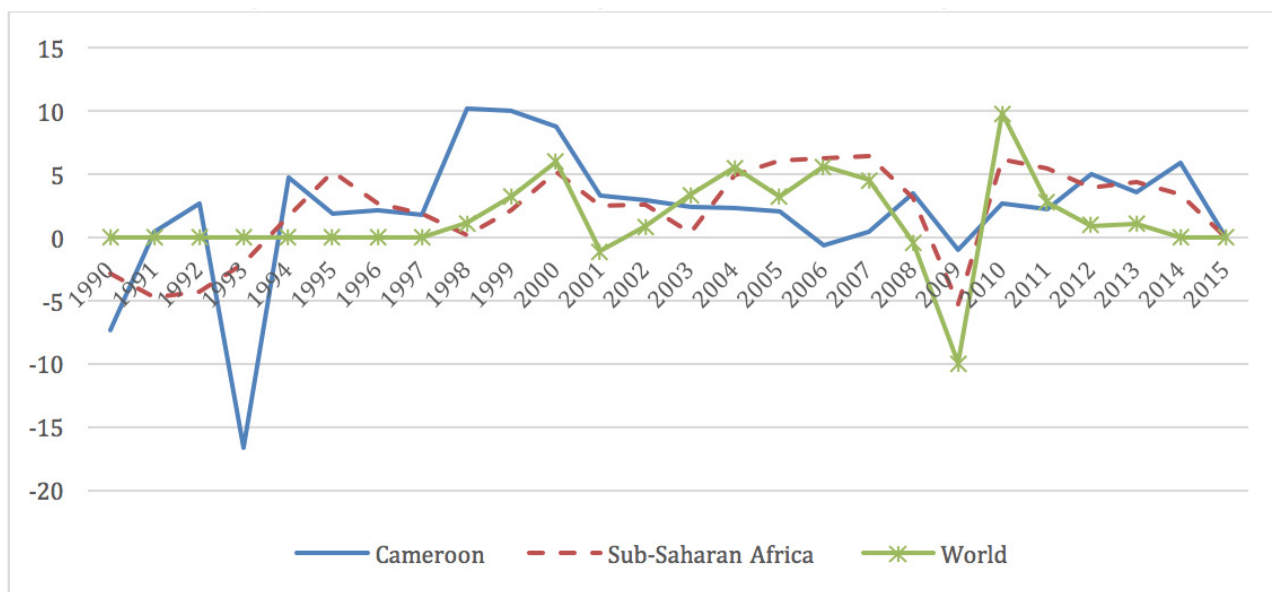
Source: Authors' Computation from WDI (2015)

We consider the data for the contribution of the manufacturing value added to the economy of Cameroon as well as the world average and the SSA average. We report these statistics in Table 3.1. From the Table, we observe that there has been equivalent contribution of the manufacturing sector in Cameroon when compared with the average of the SSA countries as well as the World average. For the entire period observed, the manufacturing sector contributed about 20.4 and 19.9 percent in the period 1996-2005. However, in later years, the trend has remained on the decrease, which may likely pose as a challenge, especially when considering sustainable industrial policy for post 2015. Although this decrease is not peculiar to Cameroon, however, it suggests that the manufacturing sector is becoming less productive. This trend also agrees with Figure 3.1, where it was observed that there is a downward trend in the manufacturing growth rate of Cameroon.

Table 3.1:   Manufacturing Value Added as a Percentage of GDP

	1991-95	1996-00	2001-05	2006-10	2011-15
Cameroon	18.837	20.426	19.946	16.018	14.446
Sub-Saharan Africa	14.410	13.437	12.875	11.304	10.848
World	0.000	19.059	17.484	16.426	15.943

Source: Authors' Computation from WDI (2015)

Our study is therefore relevant as we seek to carry out an impact analysis of the effect of the government's initiative in boosting this trend and ensuring that manufacturing firms in Cameroon are efficient in utilising their capital inputs.

4. Data and Empirical Strategy

Data and Variables

Data are taken from the panel (2007 to 2009) of firm-level surveys conducted by the World Bank's Enterprise Survey project for Cameroon. The survey data contains diverse information regarding the management structure, ownership and capital structure, performance and other external factors that may affect the firms' operations such as infrastructure facility, government incentives and other institutional bottlenecks like corruption. We restrict our enquiry to manufacturing firms involved in some form of cross-border trading. This is because: (i) accounting data is generally collected for only manufactured firms in the Enterprise Survey program; (ii) these firms are involved in the real sector and their productivity is what drives the industrialisation process of countries (Gui-Diby and Renard, 2015); (iii) finally, our incentives measures are geared towards those that support import and export, as well as profit. This being the case, the focus on manufacturing firms that are somehow involved in cross-border trade will be most suitable for our type of analysis. Also, following the wisdom of Clarke (2012), we omit micro-enterprises and informal enterprises, and focus on manufacturing firms with over 5 employees since these categories are the ones most likely to be involved in international trade (i.e. export and import) and their productivity will have a significant impact on the economy of countries in this region in terms of job creation and economic diversification (see UNECA, 2013).

We identified information on firms' output (using annual sales) and recorded the value of firms' assets (input), which enable us to compute the measure of the natural logarithm of firms' productivity based on the ratio of firms' output to input. The values were converted to US Dollars using the prevailing exchange rate as at the period of the survey. We use this measure because of the scantiness of the data on intermediate inputs. With this measure, we are able to compute the ratio of output that can be generated with the firms' available input.

Information regarding fiscal incentives given by the government to specific firms is also captured in the survey. There are five categories of these incentives that are identified in the survey. They include: exemptions from duties on imported inputs, profit tax exemption, value added tax (VAT) reimbursement, export financing scheme and export/investment incentive scheme. The impact of each of these incentives is examined separately in order to observe their individual effects on productivity, and to enhance our policy recommendations. It is important to state that these are the popular forms of fiscal incentives that are prevalent among many African countries, especially our sample - Cameroon.

As identified from the consensus in the literature, firms' productivity is explained by many other factors that are either internal or external to the firm. For the internal factors, we pay attention to the productive capacity of the firm, the size of the firm, the labour input of the firm, and the running cost of the business in generating electricity. Some of these variables feature in a typical Cobb-Douglas production function and are regarded as important in explaining the efficiency of a typical manufacturing firm in our context (see Arnold, Mattoo and Narciso, 2008). Focusing on the covariates, the productive capacity of the firm (especially because it is captured as the value of machinery) appears to be the most problematic. This is because of some measurement issues and biases that may be associated with its disclosure. Since most machinery are long-lived and frequently used for production, it is difficult to measure their yearly contribution to output. As these machinery age, their rate of production decreases due to depreciation. Since firms have an incentive to overstate depreciation and understate their physical capital due to tax

purposes (Clarke, 2012), the book value of the capital asset will not be an accurate measure. Therefore we considered the current resale value of the machinery and equipment as our measure of productive capacity. This measure has gained credence in extant literature such as Arnold, Mattoo and Narciso (2008) and Clarke (2012).

The size of the firm is measured using the value of land owned by the firm. We could have used the number of employees of the firm to capture this variable as in Arnold, Mattoo and Narciso (2008); however this data was very scanty. Apart from this constraint, we believe our measure is relevant because our study focuses on manufacturing firms and landed assets remains a very significant measure of the weight of industrial development (see Cotula et al., 2009). In essence, smaller firms are more likely to occupy a smaller span of landed assets than larger firms. More so and in recent times, landed assets has gained significant attention as an explainer of the influx of investors into African countries (see Osabuohien, 2014).

Labour input is measured using the cost of labour (including wages, salaries and bonuses) and was included to capture the value of the human factor in the production process. We also controlled for the firm's overhead cost of generating its own electricity by using the firms' average yearly expenses on fuel to generate power. In Africa, power is a significant infrastructure that affects the productivity of firms (see Ndichu et al., 2015), and it is even recorded that some African countries witnessed firm migration to neighbouring countries due to inefficiency caused by poor power supply. Therefore, the inclusion of this variable can improve the predictability of our empirical model. Table 4.1 gives a summarised overview of the variables in our model as well as a concise description of the measures.

Table 4.1: Main Variable Description

Variable	Description
Productivity	The ratio of firms' output (sales) to firms' input (total asset available to the firm). This is a ratio measured in the respective year's exchange rate in USD.
Fiscal Incentives	Three measures are used including: import duty exemption, profit tax exemption and export financing. Firms that benefit from each of the incentives are recorded as "1", and "0" otherwise.
Productive capacity	The current resale value of the machinery and equipment. This variable is converted to the respective year's exchange rate in USD.
Size	The value of the firm's landed asset. This variable is converted to the respective year's exchange rate in USD.
Labour input	The cost of labour (including wages, salaries and bonuses) measured in the respective year's exchange rate in USD.
Cost on power	The firms' average yearly expenses on fuel to generate power, measured in the respective year's exchange rate in USD.

For robustness, some other control variables like the firms' location and age will be considered. The location of the firm captures the locational advantage of the firm, in terms of whether the firm is located in the capital city "1" or not "0". The age of the firm measures its experience such that it records the number of years that the firm has been in existence in the particular business.

Empirical Strategy[2]

Correlation analysis and kernel density plot will be employed to present a brief description of the data and to evaluate the expected relationships.

The main empirical strategy for this study is such that estimates the mean effect of benefiting from the fiscal incentives on the firms productivity. In this case, the mean effect of this benefit is termed "participating in the program", which is the treatment effect. Therefore we will be required to make an inference about the productivity of the firm that would have been observed for the treatment group (those that benefit from the program) if they had not been treated – i.e. if they had not benefited from the program (control group). The main advantage of this form of empirical strategy is its ability to generate a control group that has similar distribution of characteristics as the treatment group. As a result, we can compare the actual effect of the program on the treated groups. The treatment effect is therefore calculated as the difference of the mean outcomes.

Explaining this process in mathematical terms, we assume: there are two groups of firms that are indexed by participation status in the fiscal incentives that are offered by the government, such that P=0/1, where 1 (0) indicates that the firm did (did not) benefit from the incentive. The participation is expected to yield an outcome:

Y_i^1 : which is the productivity of the firm conditional on benefiting from the fiscal incentives (i.e. P=1) or

Y_i^0 : which is the productivity of the firm if the firm did not benefit from the fiscal incentives (i.e. P=0).

Therefore the Average Treatment on the Treated Effect (ATT) will be such that:

$$ATT = E(Y_i^1 - Y_i^0 \mid P_i = 1)$$

Further disintegrating this equation, we derive:

$$ATT = E(Y_i^1 \mid P_i = 1) - E(Y_i^0 \mid P_i = 1)$$

Where E(.) represents the average (or the expected value). The later equation tends to answer the important question "how much would be the productivity of firms that benefited from the fiscal incentives compared to what they would have experienced without having participated in the program?"

From our dataset, we are able to access the data on $E(Y_i^1 \mid P_i = 1)$, , but we are constrained with accessing the equivalent data for $E(Y_i^0 \mid P_i = 1)$. To derive this data, we will require matching to clearly estimate the average effect of the treatment on the firms that participated in the program assuming they had not been treated. This approach compares the effect of the incentives on firms' productivity with those of matched non-participants (those that did not benefit from the incentives) where the matches are chosen on the basis of similarity in observed characteristics. In this case, the covariates that are earlier discussed will form the basis for the similarity. This approach was advanced by Rosenbaum and Rubin (1986) who proposed the use of the propensity score matching (PSM) approach as a reliable technique to derive the equivalent data from the non-participants.

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2. This section benefits from the framework of Pufahl and Weiss (2008).

The main essence for the PSM is to identify those non-participants that are similar to the participants in all the pre-treatment characteristics and attributes, and then attribute their outcome differences to the effect of the treatment (see Caliendo and Kopeneig, 2008). A propensity score is developed, which will be used for the matching. The propensity score is based on a firm's probability to participate in the program (fiscal incentives), which is estimated using a logit or probit model.

It is important to state the main underlining assumptions guiding the PSM analysis. They include: first, the conditional independence assumption, which is based on the understanding that the potential outcomes for non-treatment are independent of the participation status of the firm given a set of observable covariates "X".

i.e. $Y_i^0 \perp P_i | X$

Hence, after adjusting for observable differences, the mean of the potential outcome (i.e. productivity of the firm) is the same for both the participating and non-participating group (i.e. P = 1 and P = 0). This condition permits for the use of matched non-participating firms to measure the outcome of participating firms had they not participated in the treatment.

Hence, $(E(Y_i^0 | P = 1, X) = E(Y_i^0 | P = 0, X))$

The second assumption is the common support condition, which is based on the expectation that for each value of "X", there is a positive probability of either being treated or untreated. This assumption supports the overlap condition such that the proportion of treated and untreated firms must be greater than "0" for every possible value of "X". Hence, it ensures that there is a sufficient overlap in the characteristics of the treated and untreated firms to find adequate matches. Once these two conditions are satisfied, the treatment assignment is said to be efficient (Rosenbaum and Rubin, 1983). This approach has gained credence in Nkhata, Jumbe and Mwabumba (2014), among others.

The PSM applies different matching algorithms to derive its predictions. The common algorithms include: the nearest neighbor matching (NNM), the radius matching (RM), the kernel matching (KM), and the stratification method (SM). The NNM is such that focuses on the comparison of the outcome of the participants with the closest and most similar non-participants in terms of propensity scores. This approach tries to minimize the distance between the propensity score of the treated observation (P_i) and that of the control observation (P_j):

i.e. min $||P_i - P_j||$

The RM is such that the distance between the treated observation and the control observation should fall within a specified radius (r). This is such that the propensity scores of these two sets of observations are similar and are within a specified radius:

i.e. $||P_i - P_j|| < r$

In the KM, each treated observation "i" is matched (using the propensity scores) with other control observations that have weights that are inversely proportional to the distance between the two groups (i.e. treated and control observations).

$$i.e.\ w(i, j) = \frac{k(\frac{P_i - P_j}{h})}{\sum_{j=1}^{n0} k(\frac{P_i - P_j}{h})}$$

Where *h* is the bandwidth

The SM approach is such that matching is based on the intervals or blocks of propensity scores. For a robust estimation, we will be applying all the matching algorithms to evaluate the impact of benefiting from the fiscal incentives on productivity.

5. Descriptive statistics

Sample characteristics

In Table 5.1, we report the firm characteristics distributed across those that received the different categories of incentives (import duty exemption for imported input, profit tax exemption and export financing) and those that did not receive these forms of incentives. The latter is the control group, while the former is the treated group. On average, the firms in the two categories are similar in many respects considering that there was no statistical difference between their basic economic characteristics, such as the capital intensity, land available to the firm, labour cost and cost of operation – in terms of purchase of fuel for the provision of power supply. However, if closely observed, some slight differences can be observed in these values. For instance, firms that benefit from the different categories of fiscal incentives, tend to have a higher overhead cost (in terms of labour cost and the cost of generating private power supply by purchasing fuel) than firms that do not enjoy these benefits. In contrast, the firms that enjoy these incentives tend to have a lower capital cost compared to their counterparts, which may suggest that the incentives are targeted at reducing the operational cost of firms.

The fiscal incentives in Cameroon seem to be on course with the tenets and recommendations in the literature that for there to be a sustainable industrialization process, policies must aim at reducing cost of production and encourage economies of scale (UNCTAD, 2014). The effect of the incentives is seen in the difference in the productivity of these firms, as firms who benefit from most of these incentives seem to outperform those that did not benefit: however, the significant levels are not verified. From Table 5.1, firms that benefited from import duty exemption and export financing had a higher productivity than their counterparts that did not benefit from these forms of incentives. Nonetheless, the contrary is observed for profit tax exemptions: firms that did not benefit from this form of incentives had a higher productivity.

Considering the other characteristics like the location of the firm and the experience in doing a particular business, Table 5.1 reveals that most of the incentives are not equally redistributed across location: most of the firms that enjoy these incentives are located in the capital cities (i.e. 66% for import duty exemption; 40% for profit tax exemption and 33% for export financing). Likewise, younger firms seem to enjoy import duty and profit tax exemption. Older firms benefit from the export financing. In addition, the differences in the experience of the firms across the different categories of the beneficiaries of the incentives may not necessarily mean a bias towards younger firms, but could also be the result of participation.

Table 5.1: Basic Sample Characteristics

	Import Duty Exemption			Profit Tax Exemption			Export Financing		
	Benefited from Import Duty Exemption	Did not Benefit from Import Duty Exemption	Prob. Value	Benefited from Profit Tax Exemption	Did not Benefit from Profit Tax Exemption	Prob. Value	Benefited from Export Financing	Did not Benefit from Profit Tax Exemption	Prob. Value
Productivity (Ratio)	4.30(5.03)	4.29(21.36)	0.5	1.97 (1.28)	2.78(4.06)	0.24	4.41(4.75)	4.29(21.46)	0.51
Productive Capacity (Machinery Cost) in Million USD	0.41 (0.73)	28.7 (395.0)	0.43	0.29(0.56)	97.4(759)	0.32	0.018(0.029)	2.90(3.97)	0.41
Size (Value of Land Owned) in Million USD	0.005 (0.022)	0.007 (0.018)	0.56	0.005(0.010)	0.003(0.012)	0.60	0.0054(0.021)	0.0055(0.015)	0.50
Labour Cost (Annual Cost on Labour) in Million USD	3.54(8.55)	1.23(6.74)	0.18	8.02(25.3)	7.18(30.5)	0.014**	2.58(7.62)	1.24(6.77)	0.72
Cost on power in Million USD	0.046(0.085)	0.020(0.072)	0.357	0.041(1.09)	0.014(0.041)	0.07***	0.025(0.073)	0.021(0.073)	0.57

Correlation Analysis

We present the correlation analysis to observe the bivariate association between the explained variable (productivity) and the explanatory variables of interest (including the robustness check variables – location and age of the firm). The columns marked "yes" contain the results for firms benefiting from any of the incentives reported, and "no" for those firms that have not benefited from any of the incentives. The results in Table 5.2 show some level of variance in the association between the variables across firms that benefited from the incentives and those that did not. For instance, across the columns that are marked as "yes", firms' machinery (i.e. productive capacity) maintained a consistent positive association with firms' productivity. Contrary behaviour is observed for columns marked as "no". In same vein, all the other explanatory variables are positively associated with productivity for firms that have benefited from these incentives. This was different for those firms that have not benefited from any of these incentives.

Table 5.2: Pairwise Correlation Coefficients of Selected Variables across the Different Types of Incentive

Variables	All Firms	Import Duty Exemption		Profit Tax Exemption		Export Financing	
		Yes	No	Yes	No	Yes	No
Productive Capacity	-0.321*	0.299	-0.335*	0.510	-0.636*	0.408	-0.313*
Size of the Firm	-0.120	0.063	-0.134**	0.454	-0.142	0.118	-0.124***
Labour input	-0.102	0.103	-0.136**	0.387	-0.157	0.066	-0.116***
Cost on power	0.154**	0.313	0.114***	0.424	-0.017	0.139	0.128***
Location	0.078	0.064	0.049	0.516	0.166	0.302	0.047
Age	0.003	0.183	0.005	0.563***	-0.213***	0.496	-0.017

Note: The subscript *, ** and *** imply significance levels at 1, 5 and 10 percent respectively.

*Kernel Density Plot: Productivity and Fiscal Incentives*

Though the previous result is interesting and can foretell the impact of incentives on firms in Cameroon, we are not able to rely on this result for a robust inference since this analysis is only based on a bivariate relationship. As a result of this, we are moving ahead to consider the productivity of firms in the two categories of firms – i.e. those that benefited from any of the incentives and otherwise, by presenting their kernel density plots in order to observe their respective biases. We prefer the kernel density plot in the description of the data because it estimates the probability density function of productivity based on our observed sample. More so, it allows for a smooth distribution of productivity across the entire and sub-samples of the firms – i.e. those that (and did not) benefit from any of the incentives – which makes for an efficient inference (see Barron, 2014).

To understand overall productivity benefit associated with fiscal incentives, it is therefore necessary to derive more aggregate fiscal incentive measures, allowing for better comparison of firms that benefited, and those that did not benefit, as well as the overall sampled firms. This measure is such that the firms were attributed 1 if they have benefited from any of the three categories of the incentives (i.e. import duty exemption, profit tax exemption and export financing) and 0 otherwise. The plot is presented in Figure 5.1 and the three lines in the Figure represent the aggregate sample and the sub-samples according to the firms benefiting from any of these forms of incentive.

From the Figure, it is observed that firms benefiting from any of these forms of incentives are biased

rightwards. Their density overlaps with the density of those not benefiting from any of the incentives, as well as the density of the total firms. This means that firms enjoying any of these forms of incentives have higher productivity relative to firms not benefiting from these incentives. On the other hand, firms not benefiting from any of these incentives are biased leftwards, suggesting that they are less productive than their counterparts. We therefore infer that firms that benefit from these forms of incentives have a higher productivity and they tend to be relatively more productive than their non-beneficial counterparts.

Figure 5.1: Productivity of Firms by their Benefiting from any of the Incentives (i.e. Import Duty Exemptions, Profit Tax Exemption and Export Financing)
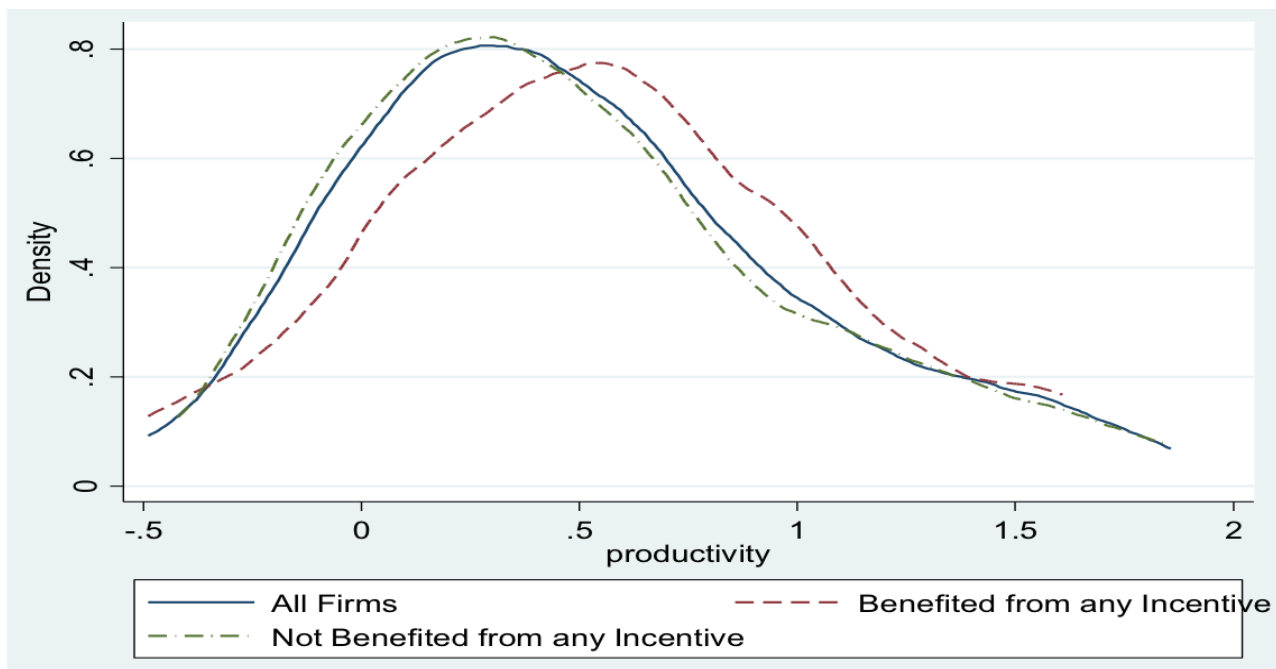
5.2 Econometric results[3]

The observed differences in the productivity of firms that have benefited from any of the incentives vis-à-vis those that have not benefited, suggest positive average productivity effects. However, the outcome differences may also be the results of already initial differences in some of the underlining peculiarities of the firms in any of these categories. As a result, we therefore apply the econometric methods elaborated in the fourth section. We start by estimating the firms' propensity scores using a probit model; we then use these scores as the basis for the matching procedures.

It is important to note that we are estimating the PSM differently for the three categories of incentives that are of interest to us. This is to enable us have a clearer perspective on the impact of each of these incentives on the productivity of firms across our sample, and to enhance the quality of our predictions. As such, using aggregate data to capture the overall incentive may not be relevant henceforth. The firms that benefit from any of these incentives are the participants, while those in the other category are the non-participants.

Variable Selection in the PSM Estimation

There is no consensus on the type of covariates to be included in the discrete choice model when estimating the propensity scores (see Austin, 2011). However, Heckman et al., (1997) suggest that: to eliminate

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3. Please note that henceforth, the word participants and non-participants, as well treated and untreated are used interchangeably.

biases due to variable selection, it will be relevant to include all variables influencing participation and outcome. Therefore, our variables were carefully selected by drawing from the available literature (see preceding section) as well as information available in our database. All the variables had complete data in our main data source.

Determinants of Participation

Table 5.3 shows the estimated probit models used to derive the propensity scores. In the import duty exemption productivity model (see column 1), the firms' overhead expenses such as labour cost and the cost of generating electricity through the purchase of fuel are significantly associated with participation. The positive sign suggests that firms that incur more of these overheads have to rely on import duty exemption. Similarly, firms in this category also rely on profit tax exemption since the signs of these variables are positive and significant in the second column of the Table. However, moving on to the third column, we observed a slight change: the cost on labour was no longer significant – although it was positive. Nonetheless, the cost of generating electricity through the purchase of fuel remained positive and significant. This suggests that this variable is an important determinant of participation for all the three categories of fiscal incentive that is being observed in this study.

The negative association between firms' productive capacity (in terms of cost of machinery) and the likelihood of participation (see column 3 in Table 5.3) suggests that firms with high productive capacity may be less likely to benefit from the export financing initiative of the government. The non-significance of the size of the firm (measured using value of land owned by the firm) is less straightforward since it was not significant in all the columns. The negative sign suggests that the size of the firm may not be an important determinant of participation. Caution should to be applied in interpreting this result considering our measure of firm size.

Table 5.3: Determinant of Participation (excluding the Robustness Variables)

Variables	Participants Benefiting from Import Duty Exemption	Participants Benefiting from Profit Tax Exemption	Participants Benefiting from Export Financing
Productive Capacity	-0.099 (0.298)	0.042 (0.676)	-0.199** (0.034)
Size of the Firm	-0.184 (0.290)	-0.164 (0.556)	-0.178 (0.243)
Labour input	0.594** (0.012)	1.153** (0.038)	0.027 (0.875)
Cost on power	0.220*** (0.055)	0.804** (0.021)	0.312*** (0.073)
Constant	-5.167** (0.029)	-8.221** (0.014)	-1.306 (0.349)
Pseudo R2	0.1171	0.189	0.143
Observations	155	147	155

Note: The subscript *, ** and *** imply significance levels at 1, 5 and 10 percent respectively.

Overall, our result is consistent with the earlier findings from the descriptive statistics. More so, noting

that incentives are supposed to compensate for some deficiencies in the business environment of countries (see UNCTAD, 2003), the significance of the firms' overhead variables magnifies this expectation. It can be said that among the main determinants of participation in our analysis, is the fact that the firm incurs huge cost on the purchase of fuel in generating its own electricity and on labour cost. The productive capacity may only be relevant for export financing.

Matching Quality

Before reporting the estimated treatment effects (ATT), we need to ensure that the matching process eliminates any mean differences that may occur after matching between the groups. The existence of mean difference may suggest that some bias exists in the matching process. Therefore to determine the quality of our matching process, we followed Rosebaum and Rubin's (2002) by dividing the propensity scores into blocks among the groups. This is deemed essential in order to improve the balancing of the covariates.

Table 5.4 presents the propensity scores for the blocks among the treated and untreated groups. The mean propensity scores were not different between import exemption participants and non-participants (i.e. 0.084 and 0.031), between profit tax exemption participants and non-participants (i.e. 0.299 and 0.141), and between participants in export financing and non-participants (i.e. 0.099 and 0.036). More so, the Table reveals that, across the models, the scores for both groups are within common range and there is no significant difference existing in the distribution of the scores. These results thereby satisfy the balancing condition suggested by Becker and Ichino (2002).

Table 5.4: Propensity Scores of Treated and Untreated Group

Models		Propensity score			
		Min	Max	Mean	Sig
Import Duty Exemption	treated	0.023	0.275	0.084	0.999
	untreated	0.006	0.130	0.031	
Profit Tax Exemption	treated	0.146	0.601	0.299	0.994
	untreated	0.003	0.663	0.141	
Export Financing	treated	0.023	0.293	0.099	0.996
	untreated	0.001	0.328	0.036	

The common support and overlap assumption of the PSM is another important condition that must be satisfied to ensure that firms with similar covariates have a positive probability of being either participants or non-participants (see Heckman, Lalonde and Smith, 1999). As earlier stated, the rule of thumb is that the common support must be greater than zero and less than 1. Therefore we report the common support boundaries for participants from our estimation for each of the estimated models. For the first model that estimates the impact of participating in the import exemption, the common support are within the range of 0.0234 and 0.2748; for the profit tax exemption, the common support are within the range of 0.1462 and 0.6009, while for export financing the common support are within range of 0.0226 and 0.2925. The region of the common support for all the estimated PSM indicates that there was a balance between covariates of participants and non-participants for the groups.

Therefore having satisfied the two conditions for effectively matching the participants and the non-

participants, we go ahead to predict the estimated treatment effect (ATT).

Estimated Treatment Effects

Table 5.5 shows both the bias-adjusted and unadjusted estimates of the ATT from four matching methods to check the consistency of the result. The essence is to evaluate the impact of the different dimensions of fiscal incentives on productivity, using firm productivity data as the outcome variable. Thus, the Average Treatment on the Treated Effect (ATT) was estimated using the ATT equation discussed in the third section in the region of common support identified earlier (see preceding section). The common support condition is imposed in our ATT analysis to ensure the groups are within the same range of propensity scores. The treatment effects are derived using four matching estimators, namely, the nearest neighbor matching (NNM), the radius matching (RM), the kernel matching (KM) and the stratification method (SM). The default 0.06 bandwidth is used for the KM and 0.1 caliper for the RM, while five nearest neighbours are used with the NNM and the propensity scores of the closest blocks are used for the SM. Also, from the Table, we observe that the bias adjustment values are consistently lower for all the matching types, which signifies that the PSM is sensitive to the unobserved characteristics. Therefore for brevity, we report in the text only the results for bias adjustment from nearest neighbour matching.

Table 5.5: Average Treatment Effect for Productivity

Treatment	Bias Adjustment	Nearest Neighbour Matching		Kernel Matching		Radius Matching		Stratified Matching	
		ATT	Std. Err.	ATT	Std. Err.	ATT	Std. Err.	ATT	Std. Err.
Import Duty Exemption	No	0.243	0.216	0.108	0.182	0.017	0.206	0.007	0.206
	Yes	0.243	0.261	0.108	0.182	0.017	0.113	0.007	0.176
Profit Tax Exemption	No	0.465*	0.059	0.677*	0.056	0.837	0.647	0.273*	0.036
	Yes	0.271*	0.059	0.677*	0.056	0.330*	0.084	0.257*	0.036
Export Financing	No	1.054*	0.338	0.401*	0.148	0.638*	0.368	0.661*	0.210
	Yes	0.894*	0.338	0.401*	0.148	0.638*	0.410	0.661*	0.100

Note: The subscript *, ** and *** imply significance levels at 1, 5 and 10 percent respectively. He variables used to determine this statistics are in their log-linear form. This suggest that any coefficient in the Table will be interpreted as percentage change.

Considering the participation in the import duty exemption, we find that there was no significant average treatment effect on the productivity of firms in the column that contains the nearest neighbor matching technique. In addition, scanning through the columns for other matching techniques, it was observed that none of the ATT values was significant. This indicates that increase in the productivity of participants in the import duty exemption treatment was not significantly higher above what they could have earned if they did not participate in this treatment. Of course, we cannot conclude in sacrosanct that government involvement in import duty will result in non-significant impact on the productivity of firms. However, we reserve our discussions on this result until we have conducted our sensitivity checks to ensure that our results are not driven by some elements, like the covariates that are included in the computation of the propensity scores for our observations.

For the profit tax treatment, we found that participants in this scheme are able to increase their productivity by about 27.1 percent above what they could have had assuming they did not benefit from the profit tax exemption. This result is significant at 1 percent level of significance. For the participants in the export finance scheme, we also observed that the average treatment effect was 89.4 percent, suggesting that beneficiaries of the export finance scheme had a positive improvement in their productivity by about 89.4 percent higher of what they could have had assuming they did not benefit from this scheme. This result is also significant at 1 percent.

Sensitivity Analysis

To be sure that our results are not driven by the type of covariates that are included in our PSM model, we decided to try two sensitivity checks. First, we excluded the productive capacity and size variables from the estimation since they were not consistently significant in the PSM logistic regression analysis that was reported in Table 5.3. Then we predicted the ATT estimations again to see whether our results are going to change. The results of this process are presented in Table 5.6 respectively for all the matching techniques.

Before interpreting the results, note that all the preliminary checks have been carried out but not reported in this text for brevity (i.e. they are available from the authors upon request). From Table 5.6, we observe that the participants in the import duty exemption treatment now observed a significant positive improvement in the volume of their productivity (unlike the result in Table 5.5). This result indicates that firms who participate in the import duty exemption treatment are able to increase their productivity by about 85 percent above the volume they could have produced assuming they did not benefit from this form of incentive. The result for participants in the profit tax exemption treatment as well as those in the export financing treatment remained the same as earlier discussed. They had significant increase as a result of their participation in these two forms of incentives.

Table 5.6: Sensitivity Check 1 - Average Treatment Effect for Productivity

Treatment	Bias Adjustment	Nearest Neighbour Matching		Kernel Matching		Radius Matching		Stratified Matching	
		ATT	Std. Err.	ATT	Std. Err.	ATT	Std. Err.	ATT	Std. Err.
	No	0.852*	0.368	0.674*	0.275	0.673**	0.337	0.673**	0.337
Import Duty Exemption	Yes	0.852***	0.484	0.674*	0.275	0.673	0.433	0.673*	0.209
	No	0.824 *	0.023		0.229	0.579*	0.260		0.262
Profit Tax Exemption	Yes	0.824*	0.058	0.435***	0.229		0.319	0.474***	0.262
	No	0.592	0.447	0.756*	0.257	0.756*	0.263	0.756 *	0.263
Export Financing	Yes	0.592**	0.273	0.756*	0.257	0.756*	0.248	0.756 *	0.317

Note: The subscript *, ** and *** imply significance levels at 1, 5 and 10 percent respectively. He variables used to determine this statistics are in their log-linear form. This suggests that any coefficient in the Table will be interpreted as percentage change.

The second sensitivity analysis involves the inclusion of other covariates in our analysis to see the possible effect on our results. We prefer the length of years that the firm has been in the particular business and the location of the firm (i.e. whether the firm is located in the capital city and otherwise) because most of the incentives that are granted by the Cameroonian government are tied to specific length of time, which indicates that the likelihood of a firm being a participant in any of the groups will be informed by their length of years of being involved in a particular manufacturing sector. For the location of the firm, we argue that the chances of firms located in the capital city to be a participant is higher than if they were not located in the capital city. Preliminary checks are also conducted to ascertain the quality of our matching when using these variables (these results are not also reported but are available upon request).

The results of the sensitivity analysis are reported in Table 5.7. The value of the ATT estimates for the participants in the import exemption scheme is not significant, but positive in all the columns. This result tends to support the findings from Table 5.5. However, when considering the impact of the other forms of incentive - like the profit tax exemption and the export financing - the results are found to be consistently positive and significant.

Table 5.7: Sensitivity Check 2 - Average Treatment Effect for Productivity

Treatment	Bias Adjustment	Nearest Neighbour Matching		Kernel Matching		Radius Matching		Stratified Matching	
		ATT	Std. Err.	ATT	Std. Err.	ATT	Std. Err.	ATT	Std. Err.
Import Duty Exemption	No	0.443	0.380	0.341	0.820	0.983	0.730	0.341	0.380
	Yes	0.381	0.330	0.341	0.820	0.983	0.730	0.341	0.290
Profit Tax Exemption	No	0.409*	0.026	0.367*	0.035	0.203*	0.049	0.212*	0.026
	Yes	0.260*	0.065	0.367*	0.035	0.115*	0.049	0.212*	0.021
Export Financing	No	0.821***	0.447	0.873*	0.289	1.002**	0.504	0.868**	0.393
	Yes	0.821*	0.027	0.873*	0.289	1.002**	0.504	0.868*	0.355

Note: The subscript *, ** and *** imply significance levels at 1, 5 and 10 percent respectively. He variables used to determine this statistics are in their log-linear form. This suggests that any coefficient in the Table will be interpreted as percentage change.

Discussion

From the analysis, we are cautious in saying that to some extent, the significant improvement in the productivity of our participants in the import exemption treatment are driven by the type of covariates that are included in our analysis. This is because in the first estimation and the second sensitivity test in Tables 5.5 and 5.7, respectively, it was not significant, but later became significant in Table 5.6. These results suggest that the involvement of the government in exempting firms from import duty may not account for a consistent significant increase in their productivity. However, for an increase to occur, there has to be a consideration of some firms' characteristics that may spur such increase. A possible explanation for this is that import duty exemption may drive inefficiency if the recipients are not carefully selected/ monitored. Possibly, if firms are allowed to utilise their capital in securing import and all the necessary

payment accompanying it, they may likely be optimal in channelling their resources appropriately. Although no consensus is reached on this, it is possible that if firms are granted import duty exemption, there is a likelihood that they may be wasteful in the purchase of resources from abroad, knowing that such purchases will not be taxed. OECD (2007) report on tax incentives for investment throws some light on this as they noted that import duty exemption is prone to abuse and easy to divert exempt purchases to unintended recipients.

The consistent positive and significant sign of the profit tax exemption and export financing participants suggest that the forms of incentives that will enhance the productivity of Cameroonian firms should be such that rewards processes. This implies that government incentive should be such that are introduced at later stages of the production process. As seen from our analysis, the import duty exemption incentive was not consistently significant in affecting productivity; however, when considering the other incentives that are introduced at the later stages of the business processes (such as profit tax exemption and export financing) it is seen that there was a significant impact on the productivity of firms. This of course, suggest that these two forms of incentives can steer up firms' ability to be efficient because; for the firms to benefit from these incentives, they have to be profitable and they should be able to produce outputs that can be consumed beyond the Cameroonian market.

6. Conclusion

In this study, we contributed to the discussion on the role of incentive in enhancing the productivity of participating in different types of fiscal incentives (i.e. import duty exemption, profit tax exemption and export financing). We applied an econometric analysis using firm data from surveys conducted between 2006 and 2009.
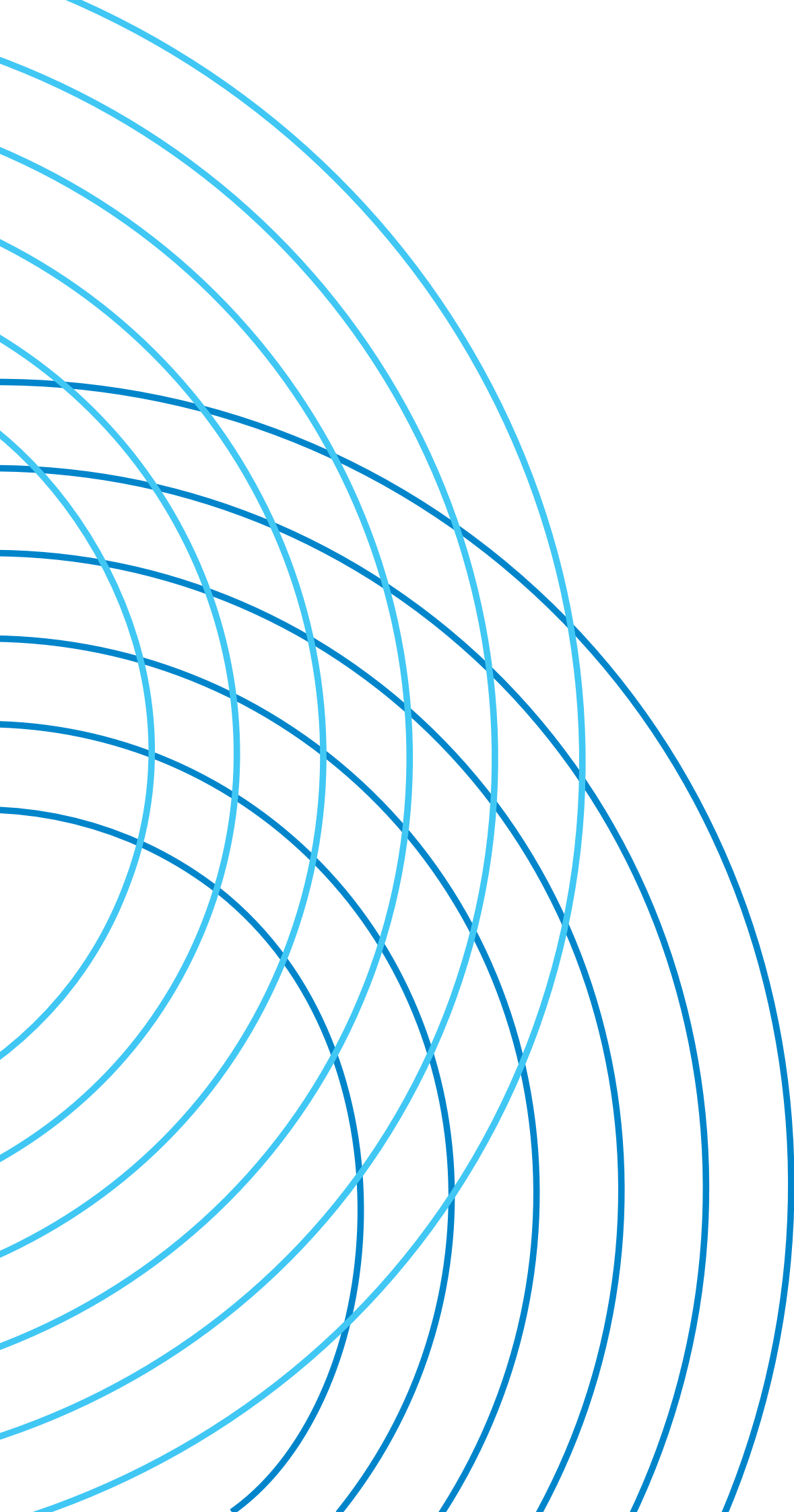
The models suggested that participation in the different forms of incentives are associated with higher productivity, however, the significance differs across the different forms of incentives. The estimations predict that participation in profit tax exemption and export financing is associated with productivity differences of around 27.1 and 89.41 percent, respectively. While the lack of baseline data and the relatively small sample size require caution in inferring causation, the results may be suggestive of underlying causal impact of participating in fiscal incentive regimes as a manufacturing firm in Cameroon.

This study is not an overall assessment of the impact of fiscal incentives on manufacturing firms' productivity in Cameroon. However, in order to decide on the overall impact, indirect effects within firms have to be taken into consideration. Overall, impact depends on intra-firm decision making of how to utilize such benefits that are derived from the government to influence its overall productivity. This highlights the need to add further explanatory variables to address this issue particularly as it relates to individual firm basis, which will be an advancement to this study.

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