**Exploring Multidimensional Fiscal Incentives and Firms’ Productivity 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, which we then used the propensity score matching technique to compute the impact on productivity. 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 for an effective industrialisation strategy.

Key Words: Developing Countries; Firm Analysis; Fiscal Incentives; Productivity

JEL Code: F13. 038. 053

**1. Introduction**

Firms’ productivity is determined by firm specific characteristics and external factors that are peculiar to the environment where the firm operates. The impact of fiscal incentives (which is an important external factor that is peculiar to the environment where the business operates) on firms’ productivity, especially in developing countries, has not reached consensus. In this paper we investigate the impact of different forms of fiscal incentives on firms’ productivity in Cameroon. Firm level data from the World Bank Enterprise Surveys data were used to achieve our objective. The survey consist of over 300 manufacturing firms and we use information on firms’ input and output to compute the productivity of firms. The enterprise survey also contains unique measures of fiscal incentives such as firms’ exemption from import duties, 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 with a focus on manufacturing firms. Our findings include, among others, that fiscal incentives are beneficial for industrialisation in Cameroon, however, the impact vary across the type of fiscal incentive being observed.

There are immense benefit from industrialisation, including job creation for sustained growth and economic diversification, 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 the trade of low value added primary products as their main export commodity (IMF, 2012; UNECA, 2013). Some important issues in Africa’s industrialisation is the need for 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). However, government support for the private sector in Africa is slack and has failed to establish an enabling environment for industrialisation (Gui-Diby and Renard, 2015).

An important aspect of government involvement is incentives, which can either be fiscal or non-fiscal. We focus on fiscal incentives since they are those fiscal measures used by the government to extend some measurable advantages to specific firms or categories of firms (UNCTAD, 2000; Fletcher, 2002). They can be in the form of tax holidays, investment allowances and tax credits, reduced corporate income taxes, exemption from indirect taxes and export processing zones. More so, proponents of fiscal incentive argue that under certain conditions, they improve investment, create jobs and other socio-economic benefits (Bora, 2002)[[4]](#footnote-4). Also, fiscal incentives can compensate for possible market failures, and can easily be implemented by African government for achieving the industrialisation drive: some African countries are already considering this form of incentive 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. Noting the revamped interest of African government to industrialise and the attention directed at including fiscal incentive as a viable policy option, our study therefore examines its impact on productivity by using case studies from Cameroon.

Cameroon is an important case considering that in 2013 the government enacted the investment incentive law No. 2013/004, which establishes the government’s commitment towards enhancing fiscal incentives for an improved investment climate. Which was the latest legislation by an African government (as at the time of this study) that was directed at using fiscal incentive for improved investment. Hence, it is worth considering an impact evaluation on which new generation of industrialization policies can be based upon, provided that the political leaders desire to sustain this momentum and move in such direction.

Focusing on fiscal incentive and firm productivity is also important for the following reasons: first, to our knowledge, there is a lack of econometric studies that analyse the impact of government incentives on firms’ productivity in Africa. Some studies closest to ours include Cleeve (2008) who used macro data analysis to underscore the importance of fiscal incentive on foreign investment in Africa. Arnold, Mattoo and Narciso (2008) considers firm-level data, but focused on services inputs. At best, there has been policy documents with country specific cases that has 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) study 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 to provide incentives that will offset the shortcomings of the impending business environment (see UNCTAD, 2000; UNCTAD, 2004; Cleeve, 2008; IMF, 2012; UNCTAD, 2015). 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, to understanding the counterfactual effect - what could have been the productivity of firms assuming they did not benefit from the introduction of the incentives.

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

**2. Review of Literature and Stylized Facts**

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, they 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 improved service industries enhances firms’ productivity. Closely related to our study – but with a different focus – is Escribano, Guasch and Pena (2010), who observed that African manufacturing firms will require an improved government commitment to infrastructural provision to enhance firm productivity.

The issue of firms’ productivity is also of importance from a policy perspective. As noted by UNCTAD (2015), the improvement of firms’ productivity 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 government commitment to provide fiscal incentives to firms in order to offset some unfavourable conditions in the business environment (see Gui-Diby and Renard, 2015; UNCTAD, 2015). Despite the need for enhanced fiscal incentives, some of its adverse consequences are highlighted in the literature. For instance, it is seen as wasteful and propelling corruption due to lack of transparency in its administration (see Cleeve, 2008). Notwithstanding the highlighted adverse effect from incentives, it is seen as a viable tool for attracting and sustaining investment. It is suggested that the effectiveness of incentives can be enhanced by focusing it to reward firm’ performance and more development-oriented goals (UNCTAD, 2004).

Fiscal incentives in Cameroon are evolving. In 1990, the investment code in Cameroon was established to grant financial concessions to firms (such as free transfer of proceeds from investment capital) in order to encourage and promote investments in Cameroon. This act also granted exemption from export duties and other export related expenses, and a rebate from the taxable income of firms that are 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 this form of incentive, 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 code, 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, which is very applicable to private investors. This law provides two categories of incentives: common incentives and special incentives. The common incentives include those benefits that are directed at firms to promote their productivity and performance. They include tax and custom duty 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, firms 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 to be met, which includes: the beneficiary firm should be involved in export activities ranging from 10 to 25 percent of sales, rule of local capacity utilisation, as well as contribute 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. The government’s main intention with these rules is to enhance industrialisation and strengthen competitiveness of firms (resident or non-resident) during these key stages of investment venture’s lifecycle (see Tabi, 2005; Biya, 2013).

The trend of manufacturing value added as a percentage of GDP for Cameroon is presented in Figure 2.1 to understand the productivity of the manufacturing sector from 1990 to 2015. The aim of this (and subsequent) stylized facts is to further emphasise the need for government interest (through incentive) in the industrialisation of our sampled country. Figure 2.1 shows that Cameroon has consistently maintained a manufacturing value added growth rate of less 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[[5]](#footnote-5), Cameroon has not performed poorly in this regard. Likewise, the Sub Saharan Africa (SSA) average was similar to the World average.

**Figure 2.1: Manufacturing Value Added as a Percentage of GDP**

Source: Authors’ Computation from WDI (2015)

The data for the contribution of the manufacturing value added to the economy of Cameroon as well as the world and SSA average are presented in Table 2.1. From the Table, we observe that there has been equivalent contribution of the manufacturing sector to the economy of Cameroon when compared with the average of the SSA countries as well as the World average. The manufacturing sector contributed about 20.4 and 19.9 percent for the period 1996-2005. However, in later years, the trend remained on the decrease and this may not be conducive for industrial policy. Although this decrease is not peculiar to Cameroon, however, it suggests that the manufacturing sector is becoming less productive. This trend is also similar with Figure 2.1.

**Table 2.1: 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)

**3. Data and Empirical Strategy**

*Data and Variables*

Data for the study is from the firm-level panel survey (2007 to 2009) of the World Bank’s *Enterprise Survey* project for Cameroon. The survey data contains different information about the management, ownership and capital structure, performance and other external factors that affects the firm’s operation such as infrastructure facility, government incentives and other institutional bottlenecks like corruption. We focus on manufacturing firms that are 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 such that support import and export, as well as profit. Hence, the focus on manufacturing firms that are involved in cross-border trade will be most suitable for our type of analysis. Also, following the wisdom of Clarke (2011), we omit micro-enterprises and informal enterprises and focus on manufacturing firms with over 5 employees. These categories of firms are involved in international trade (i.e. export and import) and their productivity have significant impacts on the economy 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 enables us to compute the measure of firms’ productivity (i.e. 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. Information regarding fiscal incentives 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 are separately examined to underscore the individual effects on productivity, and to enhance our policy recommendations. It is important to state that these measures of incentives are popular in Africa, especially for Cameroon.

Some other variables in the econometric analysis include 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. The productive capacity of the firm is measured as the current resale value of the machinery and equipment (see Arnold, Mattoo and Narciso, 2008; Clarke, 2011). The size of the firm is measured as the value of land owned by the firm (see Cotula *et al*., 2009). Labour input is measured as the cost of labour (including wages, salaries and bonuses). Firms’ overhead cost of generating electricity through yearly expenses on fuel to generate power is another important variable that is included in the econometric estimation (see Ndichu *et al*., 2015). Table 3.1 presents a summarised overview of the variables in the estimations.

**Table 3.1: 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. |

*Empirical Strategy[[6]](#footnote-6)*

Basic descriptive statistics and kernel density plots were presented to familiarise with the data and briefly evaluate the expected relationships. The quasi-experimental method of propensity score matching was used to evaluate the relationship of interest, such that it estimates the mean effect of benefiting from fiscal incentives on firms’ productivity. 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. Hence, the actual effect of the program on the ‘treated’ groups can be computed by comparing the outcome of similar group that did not benefit from fiscal incentive. The treatment effect is therefore calculated as the difference of the mean outcomes.

Explaining this process in mathematical terms, we assume that there are two groups of firms that are indexed by their fiscal incentives beneficiary status – such that P=0/1 (where 1 (0) indicates that the firm did (did not) benefit from the incentive). Benefiting from the incentives 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:

$ATT=E(Y\_{i}^{1}-Y\_{i}^{0}|P\_{i}=1)$(1)

Further disintegrating this equation, we derive:

$ATT=E(Y\_{i}^{1}|P\_{i}=1)-E(Y\_{i}^{0}|P\_{i}=1)$ (2)

Where *E*(.) represents the average (or the *expected value*). Equation (2) tends to answer the important question “how much would be the productivity of firms that benefited from fiscal incentives compared to what they would have experienced assuming they did not benefit. This is an important policy question that our estimation technique answers.

From our dataset, we are able to access the data on $E(Y\_{i}^{1}|P\_{i}=1)$, however we are constrained with accessing the equivalent data for $E(Y\_{i}^{0}|P\_{i}=1)$. To derive this data, we will require matching to clearly estimate the average effect of the treatment on the firms that benefited from incentives assuming the specific firms had not benefited. This approach compares the effect of 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 observed characteristics. The covariates earlier discussed will be included as the observed variables for the matching process as advanced by Rosenbaum and Rubin (1986) and Caliendo and Kopeneig, 2008

A propensity score is then developed based on the observed characteristics, such that the non-beneficiary firms that are similar to the beneficiaries are selected based on the similarity of their propensity scores. The propensity score is computed based on a firm’s probability to benefit from fiscal incentives, which is estimated using a logistic regression model.

It is important to state that the underlining assumptions guiding the PSM analysis include: the conditional independence assumption, which states that potential outcomes for non-beneficiary firms are independent of their participation status, given a set of observable covariates “X”.

*i.e.* $Y\_{i}^{0}⊥P\_{i}|X$

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 allows for the use of matched non-beneficiary firms to measure outcome of beneficiary firms, had they not benefited from the programme.

Hence,

$$(E\left(P=1, X\right)=E\left(P=0, X\right))$$

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 efficiency of the treatment assignment is certain (Rosenbaum and Rubin, 1983; Nkhata, Jumbe and Mwabumba, 2014).

We apply different matching algorithms for robustness. They include the nearest neighbor matching (NNM), the radius matching (RM), the kernel matching (KM), and the stratification method (SM). The NNM is focused on comparing the outcome of the beneficiary firms with the closest and most similar non-beneficiary firms, based on their propensity scores. The RM is such that the distance between the treated observation and the control observation should fall within a specified radius (r). The KM is such that 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). While the SM approach is such that matching is based on the intervals or blocks of propensity scores.

**4. Descriptive statistics**

*Sample characteristics*

We report (in Table 4.1) the firm characteristics distributed across the fiscal incentive beneficiary status of firms. On average, the firms in the two categories are similar in many respects. There is no significant difference across beneficiary firms and non-beneficiary firms when considering their productivity. Beneficiaries of import duty exemption and export financing incentive had a 0.1 and 0.21 higher productivity than non-beneficiary firms. The productivity of the beneficiaries of profit tax exemption incentive was lower by 0.81 compared to the non-beneficiaries. Though some difference exist in the productivity of firms across their beneficiary status, the difference was not significant at 1, 5 or 10 percent levels of significance. No significant difference was observed for the productive capacity of firms and firm size across their beneficiary status. A significant difference was observed for the labour and overhead cost for only profit tax exemption incentive and across the beneficiary status of firms. However, no significant difference was observed for the import duty and export financing across the firms’ beneficiary status.

Since most of the observable characteristics are similar, it is less difficult to identify a comparison firm from our sample. The distance in the mean values of the observable characteristic that differs across the two groups will be reduced in the matching process. Hence, these processes help to satisfy the key concern of the matching estimation technique (i.e. similarity of the two groups). In essence, finding individual firm units in the non-beneficiary group that are similar to those in the beneficiary group.

**Table 4.1: Basic Sample Characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Import Duty Exemption** | **Profit Tax Exemption** | **Export Financing** |
|  | **Beneficiary** | **Non-Beneficiary** | **t-stat** | **Beneficiary** | **Non-Beneficiary** | **t-stat** | **Beneficiary** | **Non-Beneficiary** | **t-stat** |
| Productivity (Ratio) | 4.30(5.03) | 4.29(21.36) | 0.50 | 1.97 (1.28) | 2.78(4.06) | 0.24 | 4.41(4.75) | 4.29(21.46) | 0.51 |
| Productive capacity  | 0.41 (0.73) | 28.70(395.00) | 0.43 | 0.29(0.56) | 97.40(759.00) | 0.32 | 0.02(0.03) | 2.90(3.97) | 0.41 |
| Firm size  | 0.01 (0.02) | 0.01 (0.02) | 0.56 | 0.01(0.01) | 0.01(0.01) | 0.60 | 0.01(0.02) | 0.01(0.02) | 0.50 |
| Labour cost | 3.54(8.55) | 1.23(6.74) | 0.18 | 8.02(25.30) | 7.18(30.50) | 0.04\*\* | 2.58(7.62) | 1.24(6.77) | 0.72 |
| Overhead cost | 0.05(0.09) | 0.02(0.07) | 0.36 | 0.04(1.09) | 0.04(0.04) | 0.07\*\*\* | 0.03(0.07) | 0.02(0.07) | 0.57 |

*Kernel Density Plot: Productivity and Fiscal Incentives*

The productivity of firms (across their fiscal incentive beneficiary status) are considered using the kernel density plots in order to observe their respective biases. The kernel density plot estimates the probability density function of productivity based on the observed sample (see Barron, 2014). More so, it allows for a smooth distribution of productivity across the entire and sub-samples of the firms based on their beneficiary status.

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 4.1 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 that benefit from any of these forms of incentives are biased towards the right. Their density overlaps with the density of those that did not benefit from any of the incentives, as well as the density of the total firms. This means that firms that enjoy any of these forms of incentives have higher productivity relative to the firms that do not benefit from these incentives. On the other hand, firms that do not benefit from any of these incentives are biased to the left, 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 4.1: Productivity of Firms by their Benefiting from any of the Incentives (i.e. Import Duty Exemptions, Profit Tax Exemption and Export Financing)**

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**5. Econometric results[[7]](#footnote-7)**

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. The reasons for 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 that should be included in the discrete choice model when estimating the propensity scores (see Austin, 2011). However, Heckman *et al*., (1997) suggest that: to eliminate biases due to variable selection, it will be relevant to include all the variables that influence 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 5.1 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: this column represents the model for participation in the profit tax exemption model. 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 5.1) 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 5.1: 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 |

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 5.2 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 5.2: Propensity Scores of Treated and Untreated Group**

|  |  |  |  |
| --- | --- | --- | --- |
|   |   | Propensity score |  |
| Models |   | 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 5.3 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 5.3: Average Treatment Effect for Productivity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Nearest Neighbour Matching | Kernel Matching | Radius Matching | Stratified Matching |
| Treatment | Bias Adjustment | ATT | Std. Err. | ATT | Std. Err. | ATT | Std. Err. | ATT | Std. Err. |
|  | No | 0.243 | 0.216 | 0.108 | 0.182 | 0.017 | 0.206 | 0.007 | 0.206 |
| Import Duty Exemption | Yes | 0.243 | 0.261 | 0.108 | 0.182 | 0.017 | 0.113 | 0.007 | 0.176 |
|  | No | 0.465\* | 0.059 | 0.677\* | 0.056 | 0.837 | 0.647 | 0.273\* | 0.036 |
| Profit Tax Exemption  | Yes | 0.271\* | 0.059 | 0.677\* | 0.056 | 0.330\* | 0.084 | 0.257\* | 0.036 |
|  | No | 1.054\* | 0.338 | 0.401\* | 0.148 | 0.638\* | 0.368 | 0.661\* | 0.210 |
| Export Financing  | 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 suggests 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 the type of covariates that are included in our PSM model does not drive our results, 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 5.1. 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 5.4 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 5.4, 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 4.3). 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 5.4: Sensitivity Check 1 - Average Treatment Effect for Productivity**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Nearest Neighbour Matching | Kernel Matching | Radius Matching | Stratified Matching |
| Treatment | Bias Adjustment | 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 | 0.435\*\*\* | 0.229 | 0.579\* | 0.260 | 0.474\*\*\* | 0.262 |
| Profit Tax Exemption  | Yes | 0.824\* | 0.058 | 0.435\*\*\* | 0.229 | 0.579\*\*\* | 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 5.5. The signs and significant 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 5.3. 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 5.5: Sensitivity Check 2 - Average Treatment Effect for Productivity**

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

Finally, the Rosenbaum checks for sensitivity of our result to unobserved variables was also performed, but not reported, and the result advance the idea that our findings are insensitive to hidden bias.

*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 Table 5.3 and 5.5, respectively, it was not significant, but later became significant in Table 5.4. 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, but it is possible that if firms are granted import duty exemption, there is the 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.

It is important to state that 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 advancement to this study.

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4. While the opponents believe that the cost of fiscal incentives (such as deteriorating governance and corruption) outweighs its benefits (see Cleeve, 2008). [↑](#footnote-ref-4)
5. The trend for the World average began in 1997. There was no data available for earlier years. [↑](#footnote-ref-5)
6. This section benefits from the framework of Pufahl and Weiss (2008). [↑](#footnote-ref-6)
7. Please note that henceforth, the word participants and non-participants, as well treated and untreated are used interchangeably. [↑](#footnote-ref-7)