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An Analysis of the Productivity of the textile and clothing industries in Cameroon[1]

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Abstract:

The objective of this study is to evaluate the productivity of industries of the textile and clothing industry in Cameroon. The study methodology is based on the Hicks-Moorsteen productivity index measured. The data used is from the General Enterprise Survey (RGE) performed in 2009, the General survey of Operators of the Cotton, Textile and Clothing sectors (ROCTC) performed in 2014 and the Survey of the Informal Sector and Employment (EESI) carried out in 2005 and 2010. The results of the evaluation of the productivity of the textile and clothing industry reveal many findings. Firstly, textile firms of the formal sector are witnessing a fall in productivity. For the textile sub-sector, the average variation of productivity is 72.96%. Secondly, firms of the clothing industry witness an increase of 13.19% in the average productivity during the study period. Thirdly, for the informal sector, the analysis of the productivity of textile companies reveals a significant drop in productivity as a whole. In fact, the average variation of the total productivity of the factors is 47.06%, showing a fall in productivity of approximately 52.03%. In the case of companies of the clothing industry, the variation of the average productivity is 56.69%, that is to say a fall of 43.31% in productivity.

Keywords: productivity, textile industries, clothing industries, Hicks-Moorsteen productivity index

1. Introduction

The productivity of the textile and clothing industry represents the starting point of industrial progress in countries engaged in a process of industrialization based on the export of labour intensive goods. Textile and clothing are among the first manufactured goods of the process of economic industrialization (Gereffi, 2002). Several reasons justify the role of textile in the economic development of a country. The textile and clothing industry generally absorbs a significant number of lowly qualified employees coming from the rural areas; its initial costs are relatively less. Also, the expansion of the sector favours the construction of capital that leads to the development of activities in other sectors that generate more value added. Lastly, the growth of the sector favours the growth of imports that incorporate advanced technologies financed by the incomes resulting from exports (Breton and Hope, 2007). In the last two decades, many South East Asian economies and China have become major exporters of cloth and clothing.

The empirical literature on the analysis of the productivity of the textile and clothing industry, using the Hicks-Moorsteen index, has ignored Sub-Saharan African countries. This study is therefore a contribution to the literature on the Hicks-Moorsteen index in Sub-Saharan African countries. Many studies focus on the analysis of the productivity of the textile and clothing industry while using the Malmquist index. The method of stochastic frontier, thanks to the distance function, can also be used to calculate the index of productivity of Malmquist and its components. Hashim and Basri (2004) calculate the total productivity of factors in the Malaysian textile, chemical, petroleum and wood industries using a stochastic frontier approach based on a translog production function between1990 and 2000, using the Malmquist index . Ikasari et al., (2014) study the productivity of the textile and clothing industry in Indonesia between 2010 and 2011 using the Malmquist index. They find a growth of productivity of 1.6% explained by technological change. Kapelko and Lansink (2015) study the productivity of the textile and clothing industry firms around the world between1995 and 2004 using the Malmquist index. They find a relatively low growth of productivity in the textile and clothing industry firms because of the growth in technical progress. Datta and Chistoffersen (2005) analyze the productivity of textile and clothing industry firms in the United States using the Malmquist index. They find a growth in productivity of 2.1% due to technological change. Wadud (2007) analyzes the productivity of textile and cotton industry firms in Australia between 1995 and 1998 using the index of malmquist and find years of fall in productivity and those of rise in productivity. Leung (1998), Fare et al., (2001) and Chen (2003) respectively study the productivity of the firms of the textile and clothing industry in Singapore, Taiwan and China using the Malmquist index. These authors find high of growth in productivity of 7.6 and 9% for Singapore, Taiwan and China respectively. Moreover, in the three cases, the growth of productivity comes from technological change. Mahadevan (2002) studies the productivity of the textile industry in Malaysia using the Malmquist index and find a low productivity of 0.3%. Joshi and Singh (2010), study the productivity of the firms of the textile and clothing industry in India using the index of Malmquist and find a growth in the

productivity of 1.7%. Goncharuk (2007) analyzes the productivity of textile firms in Ukraine using the index of Malmquist and find a fall in productivity of 7.29%. Other studies analyze the productivity of textile and clothing industry firms using the index of Malmquist: Margono and Sharma (2006) for Indonesia, Kong et al., (1999) for China and Taymaz and Saatçi (1997) for Turkey.

All these studies analyze the productivity of textile and clothing industry firms using the Malmquist index to calculate the growth in productivity and its various components. However, in spite of the obvious popularity of the Malmquist productivity index as a measure of change in productivity, the result of the estimates of Malmquist's index, besides assuming constant returns to scale remain controversial. In fact, Grifell-Tatje and Lovell (1995) show that in case of non-constant returns to scale, the index of productivity of Malmquist does not measure the change in productivity. These authors show that the bias is systematic and that it is related to the extent of the economies of scale. Coelli and Rao (2005) thus consider that it is important to impose constant returns to scale to any technology used for the estimation of functions of distance necessary for the calculation of the Malmquist index of productivity. In fact, without constant returns to scale, the result of the estimate can measure in an incorrect manner the gains or losses in productivity because of economies of scale. In this context, the index of Malmquist developed by Fare et al. (1994) is a biased measure of the total productivity of factors in the absence of the assumption of constant returns to scale. Consequently, the decomposition of the index of Malmquist proposed by Fare and al.(1994) also leads to not very reliable estimates of technical change and change in efficiency (Ray and Desli, 1997; Wheelock and Wilson, 1999). More recently, O'Donnell (2008) confirms that the decomposition of the index of Malmquist developed by Färe et al. (1994) is not very reliable.

Following studies by Bjurek (1996), recent literature clearly establishes that the Malmquist productivity index does not give a complete interpretation of the total productivity of factors. On the other hand, the Hicks-Moorsteen productivity index gives complete information on productivity (O' Donnell, 2010 ; Kerstens and Woestyne, 2014). While the Malmquist index is very popular, the Hicks-Moorsteen productivity index, although it has been in use for long remains used in a limited manner in empirical research (Kerstens and Woestyne, 2014).

In Cameroon, the Ministry of Trade reveals that 99% of the clothing consumed by Cameroonians comes from second hand clothing shops (second handed clothing imported from abroad) or from the European, American and increasingly Chinese clothes industries. The country spends nearly 130 billion francs CFA each year for the importation of clothing. At the same time, in the opinion of actors of the sector, the textile and clothing industry has witnessed an accelerated decline of its productivity except for the branch of cotton shelling. However, the country has a complete and dynamic cotton industry co-ordinated around the Cotton Development Company (SODECOTON) that produces more than 200 000 tons of cotton per year, whereas less than 5% is transformed locally. For the 2013-2014 crop year, out of a production of 249 300 tons of cotton produced in Cameroon by the Cotton Development Company (SODECOTON), only 2% of this cotton was

transformed locally. A greater local transformation is necessary to enable the national economy to multiply at each level of transformation, the value added of the sector in order to benefit from opportunities of the local and foreign market. A reinforcement of the outputs of textile and clothing industry therefore constitutes an efficient condition for the local transformation of cotton. Within the framework of its industrialisation strategy, the Cameroonian government has decided to focus on the local transformation and valorization of cotton in view of capturing local and foreign markets. In fact, in partnership with the World Bank, the Cameroonian government is engaged in a special programme for the support of the competitiveness of growth promoting sectors. This programme is focused on five non agricultural sectors judged to be the most growth carriers and having a high employment generation potential and abilities to significantly contribute to industrialisation and the diversification of exports in Cameroon (DSCE, 2009). The cotton/textile/ clothing sector is among the five growth carriers and employment generators retained by the Cameroonian government in order to promote its overall economic development. The sectorial development plan adopted in 2009 particularly seeks to strengthen the production capacities of local companies and the capturing of foreign markets. In the next ten years, the country seeks to transform 40% of the local cotton output. In the long run, the country seeks to locally transform all its cotton fiber output by 2035 (MINEPAT, 2010). The importance of the textile sector in Cameroon is not limited to the income it generates; textile is a source of livelihood for more than a million people. The challenge of the structural transformation that the Cameroonian government is facing through the valorisation and local transformation of cotton fiber raises the problem of the productivity of industries of the local textile and clothing industry.

The main objective of this study is to evaluate the productivity of industries of the textile and clothing industry in Cameroon. The empirical literature on the Hicks-Moorsteen index has ignored Sub-Saharan African countries. This study is therefore a contribution to the literature on the Hicks-Moorsteen index in Sub-Saharan African countries. This study is the first of the formal and informal textile and clothing industry in Sub-Saharan African countries. The rest of paper is organized as follows. Section 2 presents the state of the clothing and textile industry in Cameroon .Section 3 presents the methodology of the study. Section 4 comments on the results and Section 5 concludes.

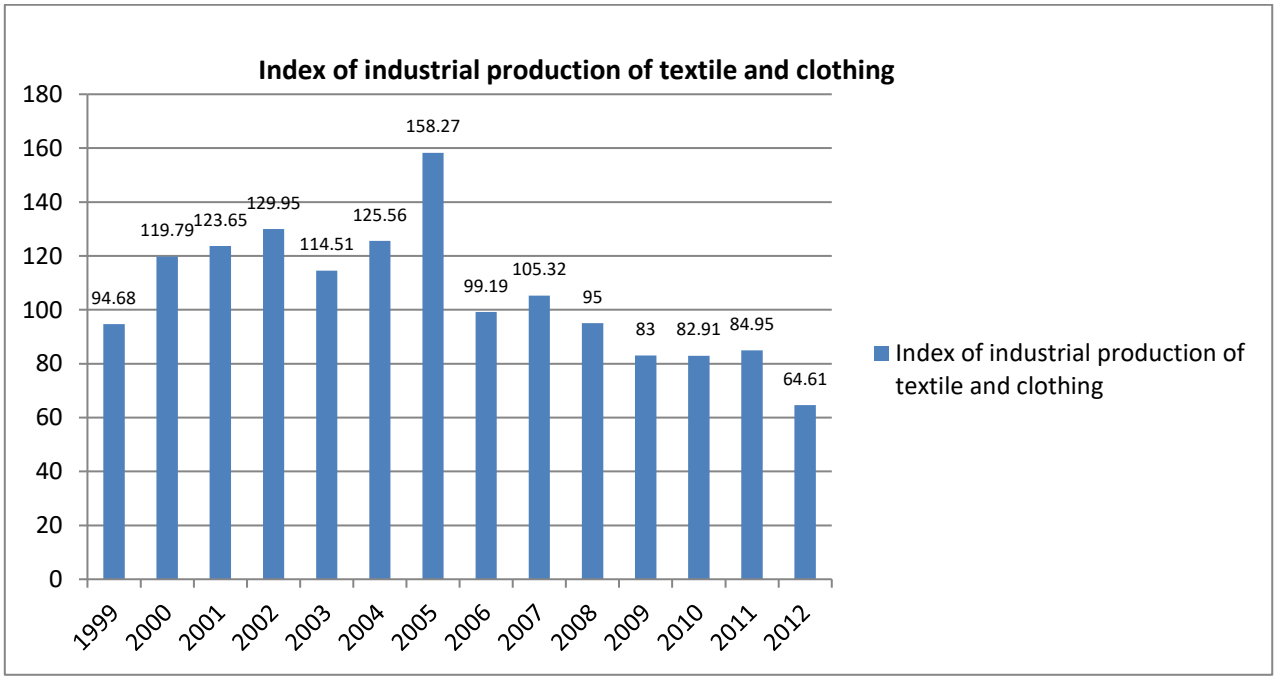
2. State of the clothing and textile industry

In Cameroon, the textile and clothing sectors are amongst the five growth carrying and employment generating sectors retained by the government and whose rapid development along with efforts in other sectors will develop the countries whole economic tissue (DSCE, 2009 ; ROCTC, 2014). The textile and clothing industries accounts for 54.7% of formal companies. However, the textile and clothing industry which has more than half of the productive units of the country accounts for only 2.8% of the industrial turnover and 16,1% of employment. The food, drinks and tobacco industries make up only 5.9% of formal companies but account for 16.7% of the industrial turnover and 22% of industrial employment (RGE, 2009). The textile sector generally covers activities going from the cultivation of cotton, its transformation into clothing products and household linens, passing through the spinning of the cotton and its transformation into fabric. In Cameroon,

the line of goods offered by the textile industry is varied: cotton fibre, thread, synthetic fibre, unbleached, dyed or impregnated cloths, sponge fabrics, clothing, household linens (table cloths, bed sheets, curtains, etc), hosiery products (men, women and children underclothing, etc), cloth or raffia bags, caps. The products of the clothing industry include: designer products (male and female jackets) made by professional designers, products of the clothing and hosiery companies: clothing products (work uniforms, sports attires), male, female and children under wears, household linens whose quality has evolved, and finally, low quality products made by independent tailors and craftsmen. (CCIMA, 2003).

The textile and clothing industry in Cameroon can be separated into the formal and informal sectors. The cotton sector occupies the third rank among manufacturing industries with a contribution of 9,5% to gross domestic product (GDP). In the opinion of professionals of the sector and the government, the textile and clothing industry has witnessed an accelerated decline of its productivity except for the branch of cotton shelling which counts for more half in the production of the sector. As an example figure 1 shows a regular fall of the index of industrial production after 2005 year . For this reason, the Cameroonian government, assisted by the World Bank, is engaged in a special program based on the local transformation and valorisation of cotton in order to revive the sector and to capture local and foreign markets. In fact, the textile and clothing industry belong to the five sectors of growth and production of employment identified by the government.

Figure 1: Evolution of the index of industrial production of the textile and clothing industry in Cameroon (1999-2012; 1990=100)



Source: NIS, 2013; Note: The base year is 1990; the index of industrial production at the base year =100. The index of the industrial production measures the evolution of the output of the industrial units carrying out their activities on the home territory during a well defined period. The indices of the industrial production are Laspeyres indices with constant weights.

The figure 1 brings out at least three main elements:

- The index of the industrial production in the textile and clothing industry had its highest increase in 2005 where it increased by 58.27% relative to the base year;
- The index of industrial production has an upward trend from 2000 to 2005

- However, after 2005, a falling trend is observed in the index of industrial production in spite of the light increase observed in 2007 (5.32%). For the year 2012, the fall of the industrial production is largest and stands at approximately 36% relative to the base year.

The industrial sector accounts for 34.1% of the informal sector in Cameroon. It occupies 38.9% of the labour used in the informal sector. The clothing and textile industry account for 5.7% of the manufacturing firms of the informal industrial sector. The activities of this industry are mainly the production of textiles and the industrial production of clothing (EESI, 2010). The market for production is mainly made up of households (94.5%),small non commercial businesses (1.2%), large non commercial private entreprises (0.1%) and small commercial entreprises (4.1%) (EESI, 2010). Informal clothing production is mainly under equipped with machines, uses a manpower that has undergone on the job-training and survives thanks to the demand of the local population. The majority of operators into clothing production are craftsmen. These tailors who generally customize clothes to the order of the customers going from given models own small isolated tailoring workshops in the quarters or grouped in the main markets. The informal textile and clothing sector remains dominated by informal production units (UPI) with only one employee. In fact, the average size of UPIs remained stable between 2005 (1.4 people) and 2010 (1.8 people) and this, no matter the place of residence. As a whole, more than 90% of the informal textile and clothing production units do not have a taxpayer's number, are not registered at the trade office, do not possess professional cards and are not registered at the National Social Insurance Fund (CNPS). The method of fixing prices is through bargaining with the customer in 76.6% of cases. The sources of capital are varied: public sector (2.2%), non commercial formal private sector (1%), commercial formal private sector (28.1%), informal non commercial sector (4.4%), informal commercial sector (27.5%), households (34.7%), imports (0.6%) and other sources (1.5%). The sources of financing the capital are mainly from savings (92.2%), gifts and inheritance. Njangi houses finance 1.4% of the capital of UPI (EESI, 2010). Table 1 summarizes the evolution of the activities of informal textile production units for 2005 and 2010.

Table 1: Evolution of the activities of informal textile and clothing production units (2005-2010)

	Monthly output (in thousands of CFAF)	Monthly turnover (in thousands of CFAF)	Monthly value added (in thousands of CFAF)	Productivity per head (in thousands of CFAF)	Average annual amount of capital pre UPI (in thousands of CFAF)	Average size	Average hourly income (in thousands of CFAF)	Average monthly income (in thousands of CFAF)	Average number of weekly working hours (hours)	Proportion of owners willing to see their child work in the UPI
2005	76,8	78.3	44.3	31.70	242.0	1.4	177.9	27.6	36.1	53.5
2010	192,2	206.1	102.5	55.83	195.2	1.8	170.3	29.7	40.6	81.7
Difference	122,4	127.8	58.2	24.13	46.8	0.4	7.6	2.1	4.5	28.2

Source EESI, 2005 ; EESI, 2010

Unlike the formal sector, the informal clothing industries develop rapidly. Equipped with 2 to 5 machines, they have tailors working day and night. Businessmen then buy the output to sell on the local or foreign market. Their output that is generally made up of male (shirts, trousers, outfits) and female (outfits from loins) is gradually rising. This output is sometimes marketed in specialized stores where it competes with imported products. These stores are generally family business using manpower supplied by apprentices. The level of

production is very low (less than 1 000 units annually), with peaks for the periods of school re-opening and end of year feasts. This important segment of the market which is made up of students and pupils is gradually facing competition from Asian products. Some of the tailors have moved their workshops to their residences where they work for businessmen who market the output, especially in the case of household linens (bed-sheets and table cloths).

3. Methodology

The methodology is based on three elements: sources of the data, the method of evaluation and justification of the choice of the variables.

3.1. Sources of data

The data bases used in this study come from the National Institute of statistics of Cameroon. The first data base is the General Company Survey (RGE) in 2009. The data used is on the firms of the textile and clothing industry. This is annual data. The Cameroonian industrial sector has 11 685 companies and is characterized by a prevalence of very small entreprises (VSE) (9 917), giving a percentage of almost 85%. Large companies as for them represent a little more than 2%. The textiles and clothing sub-sector is dominating and has 54,7% of companies (RGE, 2009). In addition, a General Census of the Operators of the Coton/Textile/Clothing (RGOFCTC) was organized at the end of 2014 to supplement the RGE of 2009 with regard to firms of textiles and clothing industry and follow the activities of the sector easily. These two databases are used to evaluate the productivity of formal textile and clothing firms.

The Employment and Informal Sector Survey (EESI), realized in 2005 and 2010 by the National Institute of Statistics is used for the measurement of the productivity in the informal textile and clothing firms. This is in fact the database of reference as regards data in connection with the non-agricultural informal sector. It has the merit of being the first nationwide survey on the employment situation and the informal sector in Cameroon; approximately 4592 informal firms were surveyed. The definition of the informal sector used is based on three criteria to determine the informal sector: administrative registration, book-keeping and the size of the firm. In an operational manner, «a manufacturing unit is considered as informal if it does not have a taxpayer's identification number, or if it is subjected to the basic mode or flat rate tax and does not keep detailed accounts, i.e. an elaborate book-keeping in accordance with the OCAM or OHADA accounting plans» (EESI, 2010).

To analyse the productivity of informal production units (UPI) of the textile and clothing sector, the Survey on Employment and the Informal sector (EESI, 2005, 2010) enables us to identify a sample of 428 informal textile and clothing production units, 102 being informal textile production units and 326 being informal clothing production units. In the case of the formal sector, the General Entreprise Survey and the General Survey of Operators of the clothing and textile sector classify enterprises of the textile and clothing sector into four sub-groups. The first group is that of very small enterprises (VSE) which are 153 in the textile industry and 533 in the clothing industry. The second group is made up of small businesses (SE). The study retains 83

in the textile industry and 276 in the clothing industry. The third group concerns medium enterprises (ME) with 42 in the textile and 105 in the clothing industry (RGE, 2009; ROCTC, 2014).

3.2. Method of evaluation

Two indices that are traditionally used to measure the total productivity of factors are the Fischer and Tornqvist indices (Coelli et al, 2005). However, The Fisher and Tornqvist indices require information on prices to aggregate the data used in the construction of input and output indices. Two indices of productivity based on the production technology and that do not require information on prices are the Malmquist productivity index and the Hicks-Moorsteen productivity index (Färe et al, 1995). The productivity index most commonly used is the Malmquist index . However, it has been shown that this index is not always an index of Total Factor Productivity (TFP). Consequently, the decomposition of the index of Malmquist proposed by Fare and al.(1994) also leads to not very reliable estimates of technical change and change in efficiency (Ray and Desli, 1997; Wheelock and Wilson, 1999). While the properties are verified under the assumption of constant returns to scale, problems or major defects appear in the presence of variable returns to scale, which largely represents the true technology (Grifell-Tatjé and Lovell, 1995). There is also a possibility that the results lead to problems of infeasibility. One can refer to the works of Bjurek et al. (1998). To resolve this problem, Bjurek (1996) proposed the Hicks-Moorsteen productivity index.

Specification of the Hicks-Moorsteen productivity index

Consider a textile or clothing industry with several outputs and inputs. O'Donnell (2008) uses the usual definitions of the total productivity of factors as formulated by Jorgenson and Griliches (1967):

$$TFP_{nt} = \frac{Y_{nt}}{X_{nt}} \tag{1}$$

Where TFP_{nt} indicates the total productivity of the factors of industry n during the period t, Y_{nt}=Y(y_{nt}) and X_{nt}=$X(x_{nt})$, where Y_{nt} and $X_{nt}$are respectively outputs and aggregate inputs of the production facility considered. According to this formulation, we can specify the changes in total productivity of the factors as the ratio of the index of quantity of output and the index of the quantity of the input or as the ratio of the growth of output and that of the input. According to O'Donnell (2010a), these indices are said to be multiplicatively complete.

The Hicks-Moorsteen (HM) productivity index is the only multiplicatively complete index which we can estimate without requiring data on prices. This index is a ratio of the output-oriented and the input-oriented Malmquist indices, thus named because Diewert (1992) traces its origins to Hicks (1961) and Moorsteen (1961). The index of total productivity of the factors of Hicks-Moorsteen is written as follows

$$HM^{t,t+1} = \left[\frac{D_0^{t+1}(x^{t+1},y^{t+1})D_0^t(x^t,y^{t+1})}{D_0^{t+1}(x^{t+1},y^t)D_0^t(x^t,y^t)}\frac{D_I^{t+1}(x^t,y^{t+1})D_I^t(x^t,y^t)}{D_I^{t+1}(x^{t+1},y^{t+1})D_I^t(x^{t+1},y^t)}\right]^{1/2} \tag{2}$$

Where $D_0(x,y)$and $D_I(x,y)$are respectively the distances functions of outputs and inputs, defined as $D_0^T(x,y) = min\{\delta > 0: (x, y/\delta)\epsilon P^T\}$, and $D_I^T(x,y) = max\left\{\rho > 0: \left(\frac{x}{\rho}, y\right)\epsilon\, P^T\right\}$, P^Tshows the set of production possibilities for T periods.

The calculation of the distance functions necessary for the calculation of the productivity index is done thanks to the DEA (Data Envelopment Analysis) method. In fact, O'Donnell (2010a) developed the DEA programs necessary for the calculation and decomposition of the Hicks-Moorsteen productivity index. The DEA method is a non-parametric method which does not make any assumptions on the behavior of the firm, the functional form of the technology of production or the distribution of efficiency.

Decomposition of the Hicks-Moorsteen index

O'Donnell (2008) shows that all indices of total productivity of factors that are multiplicatively complete can be broken up into a measure of technical change and several measures of change in efficiency. We can deduce the output oriented decomposition of TFPE in the following way:

$$TFPE_t = \frac{\mathrm{TFP_{nt}}}{\mathrm{TFP_t^*}} = OTE_{nt} * OME_{nt} * ROSE_{nt} \qquad (3)$$

With: the total factor productivity efficiency (TFPE) , the output-oriented mix efficiency (OME), the total productivity of factors (TFP), the output-oriented technical efficiency (OTE), the residual output-oriented scale efficiency (ROSE).

This decomposition can be used as a basis of the output oriented decomposition of a multiplicatively complete index of total factor productivity and rewritten:

$$\mathrm{TFP_{nt}} = \mathrm{TFP_t^*} * (OTE_{nt} * OME_{nt} * ROSE_{nt}) \qquad (4)$$

A similar equation can formulated for any firm m at the time s. Thus, the index that compares the total factor productivities of n firms during the time t with the total factor productivities of m firms during the time s will be given by:

$$\mathrm{TFP_{ms,nt}} = \frac{\mathrm{TFP_{nt}}}{\mathrm{TFP_{ms}}} = \left(\frac{\mathrm{TFP_t^*}}{\mathrm{TFP_s^*}}\right) * \left(\frac{OTE_{nt}}{OTE_{ms}} * \frac{OME_{nt}}{OME_{ms}} * \frac{ROSE_{nt}}{ROSE_{ms}}\right) \qquad (5)$$

The term contained in the first bracket of equation (5) represents technical change, measuring the difference between the maximum possible total factor productivity that can be achieved using the technology available at the time t and at the time s. Three other ratios contained in the second bracket of equation 5 represent measures of the change in technical efficiency, the change in efficiency–mix and the change in residual scale efficiency.

*The software Decomposing Productivity Index Number (**DPIN 3.0**) uses the programs developed by O'Donnell (2010a) to calculate and break up the Hicks-Moorsteen productivity index.*

3.3 Justification and choice of variables

The selection of the appropriate outputs and inputs is an important step in the calculation of productivity. Studies on the productivity of the textile and clothing industry usually use labour and capital as inputs whereas the quantities produced represent the outputs. As concerns the clothing industry, studies evaluate the productivity of Indian clothing industry firms by using the number of pieces of clothing produced as output and the number of sewing machines and tailors as inputs (Bheda, 2002; Joshi and Sing, 2009). Hashim (2005) analyzes the productivity of companies in the textile and clothing industry in India. He uses gross turnover as output while the number of employees, the number of machines and the consumption of energy in megawatt are used as inputs. Bhandari and Ray (2007) carry out their analysis in the

Indian textile industry. They retain one output and three inputs. The output selected is the total value of the products of the firm during the year. The inputs selected are labour measured by the total number of working days per worker, capital measured by the value of the fixed assets at the beginning of year and intermediate consumption (water, energy, fuel). Ikasari et al., (2014) measures the productivity of the textile in Indonesia. They use as inputs the cost of raw materials, the cost of labour, energy and gasoil. The output is the value of the textile products obtained. The choice of the variables in our study is guided by the previous studies above and the availability of data. To this end, we choose the inputs and outputs presented in table 2.

Table 2: **Variables of the study**

	Inputs (annual)	**Outputs (annual)**
Textile industry	- cost of the intermediate consumption (water, gasoil, transport, Energy in megawatt, cost of raw material) -Number of workers	-annual production (CFAF) - annual turnover (CFAF)
Clothing industry	- number of sewing machines; - number of working hours by tailor - cost of the intermediate consumption	-annual production (CFAF) - annual turnover (CFAF)

4. Empirical results

4.1. Summary **statistics**

Table 3 and Table 4 provide statistics of the inputs and outputs considered to estimate the productivity of textile and clothing industry of the formal sector. Table 5 presents the inputs and outputs used to calculate the productivity of textile and clothing industry of the informal sector.

Table 3: Formal sector /Textile industries **Very Small enterprises (VSE)**

	2008		2009		2011		2012		2013		2014	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Inputs (annual)												
Cost of the intermediate consumption (water, gasoil, transport, Energy in megawatt, cost of raw material)	924.142	1666.33	905.210	1455.256	1075.021	2011.275	1124.222	2140.21	1024.40	2088.141	1175.421	2214.247
Number of workers	2.028	1.12	2.085	1.33	2.22	1.035	3.088	1.111	3.044	1.22	3.055	1.481
Outputs (annual)												
Production annual (in 000000 CFAF)	2330.21	2926.3	1987.24	2142.45	1986.28	2075.325	2895.147	1731.24.	1896.25	2210	2140.321	1974.211
Annual turnover (in 000000 CFAF)	974.333	1732.214	1015.230	724.321	41.214	957.279	1054.621	9023.781	654.324	1079.738	830.112	1338.154

Small enterprises (SE)

	2008		2009		2011		2012		2013		2014	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Inputs (annual)												
Cost of the intermediate consumption (water, gasoil, transport, Energy in megawatt, cost of raw material)	3322.75	9129.991	3623.831	5511.121	3434.231	4723.311	3517	6623.021	3014.231	8011.247	3242.123	5012.32
Number of workers	8.83	1.105	10.33	1.123	9.17	1.19	8.013	1.13	9.25	1.027	11.14	1.065
Outputs (annual)	7586.231	17285.23	6175.23	19832.9	6.021.185	19471.21	6583	20584.2	6222.214	17624.81	6175	17212.4
Production annual (in 000000 CFAF)	6811.2	713.321	6053.321	882.4211	5824.654	1012.441	6346.78	1222.32	5830.241	1214.214	5113.21	902.321
Annual turnover (in 000000 CFAF)												

Medium enterprises

	2008		2009		2011		2012		2013		2014	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Inputs (annual)												
Cos t of the intermediate consumption (water, gasoil, transport, Energy in megawatt, cost of raw material)	13087.21	22101.111	17435.213	17446.712	15893.214	20161.33	16327.222	30112.621	19568.365	45616.916	18324.21	40222.58
Number of workers	20.22	6.024	18.11	5.084	19.12	7.023	22.14	6.041	23.15	8.015	24.81	7.032
Outputs (annual)												
Annual production (in 000000 CFAF)	71532.358	12598.235	90229.12	21579.12	61558.73	21579.12	61848.60	28640.6	51935.231	21342.241	81532.42	18414.2
Annual turnover (in 000000 CFAF)	69054.11	62458.32	81083.23	13874.33	58294.29	17217.86	59126.44	551461.60	48323.25	43145.23	73548.25	40175.68

Source : General Enterprise Survey (GES ,2009); General Census of the Operators of the Coton/Textile/Clothing 2014

Table 4: Formal sector/Clothing industries

Very smal entreprises (VSE)

	2008		2009		2011		2012		2013		2014	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Inputs (annual)												
Number of sewing machines	1.71	1.11	1.22	1.18	1.74	1.10	1.73	1.2	1.66	1.01	1.58	1.22
Number of working hours by tailor	1909.1	650,.35	1247.15	946.14	1017.17	990.21	1060.21	970.58	1210.55	876.44	1584.37	763.24
cost of the intermediate consumption	914.78	6032.99	875.23	5873.21	1014.77	4876,.23	1066.47	4587.2	1108.23	5037.1	1118.21	4250.75
Outputs (annual)												
Annual production (000000 CFAF)	1955.32	2031.32	1021.23	2412.47	1632.87	2112.34	1932.24	1897.33	2034.74	2014.42	1987.63	2366.44
Annual turnover (000000 CFAF)	801.98	2201.4	874.62	2024.21	1721.01	3055,.11	1888.23	4221.53	1947.53	5413.36	1707.47	4172.77

Small entreprises (SE)

	2008		2009		2011		2012		2013		2014	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Inputs (annual)												
Number of sewing machines;	2.24	1.49	2.15	1.35	2.54	1.66	2.641	1.7	2.19	1.29	2.33	1.25
Number of working hours by tailor	2012.24	625.5	1977.22	835.41	2443.16	832.27	808.32	965.21	2057.14	766.23	1932.44	725.87
cost of the intermediate consumption	2780.32	5123.23	2574.61	5825.65	2945.33	5732.22	2620.36	4763.58	2789.99	5029.66	2578.11	5542.88
Outputs												
Annual production (in 000000 CFAF)	3702.17	3131.22	3577.41	3012.25	3612.07	2302.01	3421.25	2057.63	3300.74	2214.52	3985.15	1965.77
Annual turnover (in 000000 CFAF)	1922.42	2201.12	2027.17	2026.55	2222.04	3166.11	2033.33	3021.22	2130.56	4013.61	1963.66	3072.24

Medium entreprises (ME)

	2008		2009		2011		2012		2013		2014	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Inputs (annual)	5.17	3.02	5.25	2.73	6.11	2.01	6.33	1.78	6.04	2.19	5.68	3.02
Number of sewing machines;												
Number of working hours by tailor	1875.34	625,39	1763,33	813.21	2122.62	651.44	1990.24	745.22	1891.32	732.25	2012.97	845.33
Cost of the intermediate consumption	3245.55	3271,2	3069,35	3257.55	3143.12	4021.31	3302.54	3985.88	3358.77	4456.57	4893.21	4632.11
Outputs (annual)	5023.27	5201.22	5167.52	5022.32	5686.14	4212.11	5821.64	4018.6	5175.33	5344.21	5362.17	487.22
Annual production (in 000000 CFAF)												
Tnnual turnover (in 00000 CFAF)	4832.11	4311.11	4923.33	4214.2	4402.15	5033.21	4753.25	4131.44	4020.11	4733.4	4276.55	5064.33

Source : General Enterprise Survey (GES ,2009); General Census of the Operators of the Coton/Textile/Clothing 2014

Table 5: Informal Sector /Textile and Clothing

	2004		2005		2009		2010	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
TEXTILE								
Inputs (annual)	252.7493	441.1844	288.7695	211.7742	1826.5507	4120.1120	1968.8709	5291.2982
Cost of the intermediate consumption (water, gasoil, transport, Energy in megawatt, cost of raw material in 000 CFAF)	1.1569	0.4635	1.191	0.3931	1.441	0.2893	1.391	0.5698
Number of worker								
Outputs (annual)								
Annual production (in 000 CFAF)	513.791	818.2021	1252.1421	1073.2140	3235.1750	963.234	4134.2485	774.7500
Annual turnover (in 000CFAF)	522.1895	827.9051	980.2873	1470.7231	3965.2418	361.7891	4829.3214	12736.6736
CLOTHING								
Inputs (annual)	1721.2	169.8	1616.9	202.6	2111.2	223.6	1851.4	135.3
Number of annually working hours (per worker)	418.5954	795.3989	724.2012	520.3230	1273.4120	210.3210	1129.7593	2006.7050
cost of the intermediate consumption	1.59	1.203	1.66	1.175	1.96	1.342	2.09	1.470
Number of sewing machines								
Outputs (annual)	988.2303	1720.6538	1096.3251	18341.2544	1789.2341	2075.2314	1997.4154	3020.1855
Annual production (in 000 CFAF)	1010.1126	1869.6293	1855.7892	2223.1420	2161.4769	4454.3317	2046.9400	3437.1873
Annual turnover (in 000CFAF)								

Source: Employment and Informal Sector Surveys 2005;2010

4.2. Hicks-Moorsteen productivity indices results

The results of the evaluation of the productivity of industries of textile and clothes industry reveal several lessons. Firstly, there is a fall in the productivity of textile industries of the formal sector. For the whole of the textile sector, the average variation of productivity is 72.96%. The fall of productivity is thus approximately 27.04%. This result is similar to those found by Goncharuk (2007) for Ukraine and Margono and Sharma (2006) in Indonesia. These authors find a fall in the productivity of the textile industry. Also, our results show that the fall in productivity is more explained by the simultaneous fall in the technical efficiency of 29.98% and of the technological progress of 22.89%. In fact, the technical efficiency reflects the capacity of the firm to increase its production for a given level of inputs. A technical score of efficiency of 29.98% thus represents the proportion in which the textile sector can improve its production without needing to modify the factors of production available. The fall in the technical efficiency of companies of the textile sector can be justified partly by the difficulties related to the supply of raw materials. In fact, the supply of raw materials is often disturbed by regular shortages, the high costs of inputs, and high customs duties which increase the prices of the imported products. Since there is no national policy specific to the textile industry as concerns raw material imports, the operators of the sector must mobilise significant financial means to supply themselves with raw materials (CCIMA, 2003). The fall in technical efficiency in the textile sector could also be explained by the quality of the labour available and the cost of energy. In fact, the local labour is little qualified. Training is ensured by professionals of the sector but the low wages paid to the personnel does not

allow the development of loyalty and the capitalization of the acquired knowledge. Thus, once they acquire the elementary bases, the apprentices settle on their account with modest means. Moreover, the cost of energy is, in the opinion of the operators of the textile sector, too high and gives a serious blow to the competitiveness of the sector. This, coupled with the frequent cuts in electricity contribute to slow down the activities of production; certain firms are obliged to resort to power generating units that weigh on the cost of production. Lastly, a fall in the technical efficiency of the textile sector could also be blamed on an artisanal organization of production and a too large diversification within the companies which lead to losses in economies of scale and an increase in production costs. The second source of the fall in the productivity of industries of the textile sector as a whole is the fall in technological progress of 22.89%. Technological progress refers to the technical and managerial innovation. This result can be explained by the weak modernisation of the apparatus of production in the textile industry in Cameroon. The production equipments are particularly old, the ratio of depreciation of immobilizations that shows the ageing of the productive equipment is situated at 75,5%; the generally allowed average being fixed around 50 % (CCIMA, 2003). Moreover, there does not exist any structure of improvement, research and technological transformation to guide, train and supervise the operators of the sector on their technological choices.

Secondly, companies of textile industry present, for the period of analysis, an increase of 13.19% in average productivity. This result is similar to that of Wadud (2007) for the Australian clothing industry and Ikasari et al., (2014) for the Indian clothing industry. In spite of the increase in the productivity in companies of the clothing industry, it should be observed that the potential of this sub-sector remains exploited. In fact, three categories of clothing industry companies cohabit in the sector: an industrial mode, a ready-made clothing mode (industry of customised clothing), and an artisanal mode (independent tailors) where one finds the largest number of operators of the sector. Industrial production which is generally made up of men's (shirt, trousers, jacket sets) and women's (sets containing fabrics loincloths) clothing is increasingly important. This output is sometimes marketed in specialised stores where it competes with imported products. Ready made clothing has many difficulties to emerge in spite of the presence of many talents, the average annual production per unit is around 25 000 units. In the first two cases, the production capacities are used only at about 40 % (CCIMA, 2006). The lack of financial support is one of the constraints that slow down the increase in the productivity of the companies of the clothing industry. In fact, nearly three quarters (74,4%) of the operators of the operators of very small enterprises and small enterprises of the sector evoke it as the most constraining difficulty. Moreover, the very high cost of the raw materials is evoked by approximately 70% of the operators as a barrier to the exercise of their activities. Lastly, 60% of the operators deplore tax pressure, making this fourth greatest difficulty of the sector (CCIMA, 2006)

Table 6. Hicks-Moorsteen productivity indices of the textile firms (*Formal sector*)

Textile firms	periods	ΔTFP	ΔTECH	Δ	ΔOSME
		OTE			
Very Small enterprises (VSE)	*2008-2009*	0.6534	0.7629	0.8063	1.000
	2009-2010	0.6667	0.7182	0.7146	1.291
	2010-2011	0.7664	0.6518	0.7583	1.550
	2011-2012	0.8430	0.6224	0.8158	1.660
	2012-2013	0.7424	0.6891	0.7659	1.406
	2013-2014	0.7690	0.7224	0.7826	1.361
	Means	**0.7401**	**0.6944**	**0.7738**	**1.371**
Small enterprises (SE)	*2008-2009*	0.6906	0.6270	0.7547	1.4622
	2009-2010	0.5789	0.7309	0.8682	0.9139
	2010-2011	0.6818	0.7997	0.7793	1.0941
	2011-2012	0.6900	0.7088	0.8228	1.1832
	2012-2013	0.6379	0.6027	0.7821	1.3534
	2013-2014	0.7311	0.6585	0.7067	1.5711
	Means	**0.6655**	**0.6836**	**0.7839**	**1.2395**
Medium enterprises (ME)	2008-2009	0.7921	0.6601	0.8723	1.1516
	2009-2010	0.7500	0.7107	0.8173	1.2911
	2010-2011	0.8314	0.6817	0.7328	1.6642
	2011-2012	0.8097	0.7665	0.7172	1.4937
	2012-2013	0.7072	0.7316	0.6928	1.3952
	2013-2014	0.8522	0.7989		1.4908
	Means	0.7155			**1.4048**
		0.7888	**0.7233**		
		0.7560			
All textile firms	**Means**	**0.7296**	**0.7002**	**0.7711**	**1.3360**

Source : From General Enterprise Survey (GES ,2009); General Census of the Operators of the Coton/Textile/Clothing 2014

Notes: ΔOTE: the change in technical efficiency ; ΔTFP: the change in total productivity of factors ;ΔTECH: the change in technological progress; OSME: the change in efficiency–mix and scale

Also, the results reveal an increase in 15.05% in average productivity for the Medium Enterprises; 13.13% for the Small Enterprises and 11.42% for the Very Small Enterprises. The sources of the rise in productivity in the companies of the clothing industry come generally from the increase in technical efficiency and the increase in the combined measurement of the variation of the efficiency-mix and scale in the case of the Medium Enterprises. In the case of Small Enterprises, the variation of the productivity is explained by the variation of the combined measurement of the variation of efficiency-mix and scale and the variation of technological progress. Lastly, in the case of the Very Small Enterprises, the increase in the productivity is explained by the variation of technical efficiency and the variation of the combined measurement of the variation of the efficiency-mix and scale.

Table 7 : Hicks-Moorsteen productivity indices of the clothing firms (*Formal sector*)

CLOTHING firms	period	ΔTFP	Δ TECH	Δ OTE	ΔOSME
Very Small enterprises (VSE)	*2008-2009*	1.1760	0.8889	1.0000	1.3229
	2009-2010	1.1034	0.8611	1.0000	1.2813
	2010-2011	1.1150	1.0000	1.0000	1.1150
	2011-2012	1.0991	0.9953	0.9640	1.1454
	2012-2013	1.1271	1.0000	1.0000	1.1271
	2013-2014	1.0677	1.0000	1.0000	1.0677
	Means	**1.1142**	**0.9556**	**0.9939**	**1.1730**
Small enterprises (SE)	*2008-2009*	1.1333	1.0000	1.0000	1.1333
	2009-2010	1.1600	1.0000	0.8574	1.3529
	2010-2011	1.1180	1.0000	1.0000	1.1180
	2011-2012	1.0894	0.9677	1.0000	1.0894
	2012-2013	1.1347	0.9188	1.0000	1.1347
	2013-2014	1.1539	1.0000	1.0000	1.1539
	Means	**1.1313**	**0.9806**	**0.9746**	**1.1606**
Medium enterprises (ME)	2008-2009	1.1743	0.8020	1.0000	1.4642
	2009-2010	1.1467	0.8758	1.0000	1.3093
	2010-2011	1.1228	0.8867	1.0000	1.2662
	2011-2012	1.1547	0.8248	1.0000	1.3999
	2012-2013	1.1721	0.9075	1.0000	1.2915
	2013-2014	1.1338	0.9122	1.0000	1.2429
	Means	**1.1505**	**0.8671**	**1.0000**	**1.3267**
All clothing firms	**Means**	**1.1319**	**0.9331**	**0.9894**	**1.2178**

Source : From General Enterprise Survey (GES ,2009); General Census of the Operators of the Coton/Textile/Clothing 2014

Notes: ΔOTE: the change in technical efficiency ; ΔTFP: the change in total productivity of factors ;ΔTECH: the change in technological progress; OSME: the change in efficiency–mix and scale..

Concerning the informal sector, the analysis of the productivity of companies of the textile sector reveals a significant drop of productivity as a whole. In fact, the average variation of the total productivity of the factors is 47.06%, that is to say a fall in productivity of approximately 52.03%. This low productivity seems to be explained more by the fall in technological progress and the fall in technical efficiency. In the case of the companies of the clothing industry, the fall in the total productivity of the factors is also significant for the whole of the period. For this group of companies, the variation of the average productivity is 56.69%, that is to say a fall of 43.31% of productivity. As in the case of the textile companies, the fall in the productivity of the companies of clothing companies of the informal sector is justified by the fall in technological progress and the fall in technical efficiency. These results are similar to those found in other studies on the productivity of the activities of the informal sector. In a general manner, a low productivity characterizes the activities of the informal sector.

Table 8: Hicks-Moorsteen productivity indices of the textile and clothing firms (*Informal sector*)

Firms	period	ΔTFP	ΔTECH	ΔOTE	ΔOSME
TEXTILE	*2004-2005*	0.5234	0.6813	0.7925	0.9695
	2005-2009	0.4338	0.6322	0.7063	0.9717
	2009-2010	0.4592	0.6178	0.8229	0.9034
	Means	**0.4706**	**0.6432**	**0.7722**	**0.9476**
CLOTHING	*2004-2005*	0.5897	0.7388	0.8764	0.9109
	2005-2009	0.6010	0.6883	0.8844	0.9873
	2009-2010	0.5145	0.7010	0.8125	0.9034
	Mean s	**0.5669**	**0.7090**	**0.8571**	**0.9331**

Source: From Employment and Informal Sector Surveys 2005; 2010

Notes: ΔOTE: the change in technical efficiency ; ΔTFP: the change in total productivity of factors ;ΔTECH: the change in technological progress; OSME: the change in efficiency–mix and scale

5. Conclusion

The objective of this study is to evaluate the productivity of industries of the textile and clothing industry in Cameroon. We use the Hicks-Moorsteen index to calculate the productivity of textile and clothing industry in Cameroon. The results of the evaluation of the productivity of the textile and clothing industry reveal many findings. Firstly, textile companies of the formal sector are witnessing a fall in productivity. The fall in the productivity of textile industries is explained by a fall in technological progress and technical efficiency. Secondly, companies of the clothing industry witness an increase in the average productivity during the study period. Thirdly , for the informal sector, the analysis of the productivity of textile companies reveals a significant drop in productivity as a whole. In the case of companies of the clothing industry, the total decline in the productivity of factors is also significant for the whole period. One of the limits of this study resides in the treatment of the textile sector as a homogeneous entity. However, this sector includes several activities, from the production of cotton to the manufacture of fabrics and thread. The evaluation of the productivity of the textile sector would thus be more complete by taking into account the individual productivities of the various activities which make the sector in order to detect the most performing. Another limit rises from the difference between the formal and the informal sectors of the textile and clothing industry. This difference present in the data used in this study is often low in reality because of the confusion which sometimes exists between the formal sector and the informal sector.

Availability of data and materials

The datasets generated and/or analysed during the current study are available in the [the National Institute of Statistics] repository, [*www.statistics-cameroon.org*]

Competing interests

The author declare that they have no competing interests" in this section.

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Authors' contributions

This study has, only, one author; this work has been realized by one author, Saturnin Bertrand Nguenda Anya

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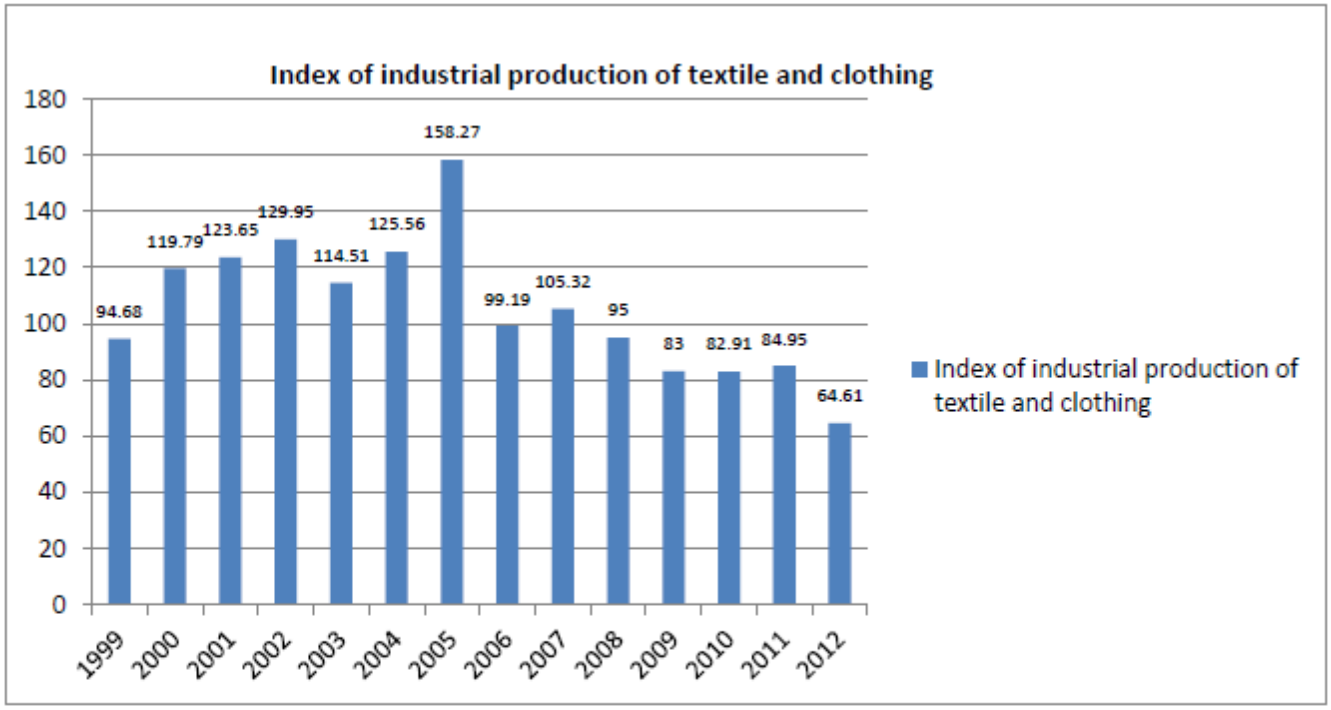
Figures



Source: NIS, 2013; Note: The base year is 1990; the index of industrial production at the base year =100. The index of the industrial production measures the evolution of the output of the industrial units carrying out their activities on the home territory during a well defined period. The indices of the industrial production are Laspeyres indices with constant weights.

Figure 2

Evolution of the index of industrial production of the textile and clothing industry in Cameroon (1999-2012; 1990=100)