Productivity Measurements in the Libyan Manufacturing Sector

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ملخص الدراسة

تهدف هذه الدراسة إلى قياس الإنتاجية في قطاع الصناعة التحويلية العام في الاقتصاد الليبي خلال الفترة (1997–2010), وذلك باستخدام بعض معايير قياس الإنتاجية، وقد أظهرت النتائج انخفاض في مستوى الإنتاجية الكلية في معظم فروع قطاع الصناعة التحويلية والفشل في تحقيق الخطط السنوية المستهدفة, وخلصت الدراسة أيضا إلى أن مجمع الحديد والصلب قد سجل أفضل معدلات الإنتاجية مقارنة مع الفروع الأخرى في قطاع الصناعة التحويلية العام.

1. Introduction:

It has become firmly established the productivity is the real source of and important for economic growth of any country; it has an essential role in the economies of developed and developing countries alike. It allows the nation to raise its standard of living, to support such social goals as education and health care, and to contribute to other aspects of the general welfare; it is an essential underpinning of the nation's security (Stupak and Leitner, 2001).

Increased productivity is the key to economic progress, where the standard of living of communities and income levels depend on the progress of the level of productivity; higher levels of productivity in economies lead to increased rates of growth and prosperity (Seid, 1996).

Keywords: Productivity, Manufacturing sector.

Industrialized countries have been interested in productivity since the beginning of the nineteenth century. An increased the real source of growth focused on increasing rates of growth through continuous improvement in productivity which led to the achievement of high growth rates. Some developing countries were able to benefit from the experience of developed countries, where the strategy aimed to improve and increase productivity, and thus were able to compete with industrialized countries. Some other developing countries realized the importance of productivity and moved towards the establishment of industrial projects, but they did not achieve high rates of productivity as this move was to set up factories and increase production without attention to the concepts of real productivity.

There is a multiplicity of concepts of productivity. Consequently, a series of definitional complexities and competing philosophies have emerged and confused the development of productivity and its related measurement. However, the general concept of productivity is the amount of output per unit of input (labour, equipment and capital). It is a measure relating a quality of output to the inputs required to produce it (Stupak and Leitner). Productivity also means optimum use of available resources, such as resources, raw materials, labour, energy and equipment, to produce the quantity required in the specified time period.

For the reason that the industrial sector plays an important and essential role in the process of growth and development (industrial countries are the best witness), this part of the study will investigate and analyze and examines productivity in the manufacturing sector in the Libyan economy, that to identify the key aspects of production and productivity in this sector, and to reach conclusions about productivity that help to understanding trends of the manufacturing sector operations in order to allow decision-makers to make the right decisions.

2. Methods of Measuring Productivity:

Productivity is defined as the ability of an organization to produce effectively and efficiently the required amount of finished goods at the lowest quantity of inputs and resources. Basically, it expresses the optimum production of organizations based on the relationship

between the quantity of goods and services produced over a given quantity of labour, capital, land, energy, intangible assets and resources (Valenzuela, 2007). The industrial sector with its forward and backward linkages and its high employment size is the key to the economic development of a country; enhancing firm's productivity in the manufacturing sector is extremely important if these firms wish to access export markets and survive international competition. Hence, the measurement of productivity in manufacturing sector projects has a positive impact on the improvement of this sector and promotes it to higher levels of growth. The quantification of productivity is a generic activity which covers several fields in both firms and countries, but productivity should be focused on particular dimensions in order to obtain quantifiable and effective results for the improvement of production operations.

Before turning to the subject of measuring productivity and its application on the Libyan manufacturing sector, it is advisable to review the most important methods of measurement in the economic literature and previous studies. There are many different productivity measures; the choice between them depends on the purpose of productivity measurement and, in many instances, on the availability of data (Harbour, 2009). Productivity measures can be classified as single factor productivity measures (relating a measure of output to a single measure of input) or multifactor productivity measures (relating a measure of output to a bundle of inputs). Another distinction, of particular relevance at the industry or firm level, is between productivity measures that relate some measure of gross output to one or several inputs and those which use a value-added concept to capture movements of output (OECD, 2001).

Organizations and companies have used several types of productivity measurement for monitoring and developing operations and strategic considerations. Several definitions have been proposed in the literature to classify productivity measures, but the most common classification of productivity measures is (Valenzuela, 2007):

- Total Factor Productivity.

- Partial Factor Productivity.

Total Factor Productivity (TFP): This is the ratio of output to the aggregate measure of the inputs of all the factors of production. Theoretically, this is the true measure of productivity as it incorporates the contribution of all the factor inputs.

$$TFP = \left(\frac{output}{input}\right) X\,100 \qquad (1)$$

where ***input*** = materials, labour, capital, which may be measured in terms of size or financial value. Thus, input and output should be expressed in similar units.

Partial Factor Productivity (PFP): There are many problems that are associated with measuring total factor productivity. For example, it is difficult to construct an index number that will serve as the input. It will mean adding hours done by labour to units of investments, the contributions of land, technology, etc. to get a single index. To quantify them all in monetary terms is very cumbersome. The construction of a total factor productivity index is, therefore, not appealing. In its place, therefore, partial productivity is used. This estimates the ratio of total output to a single input, usually labour. In most discussions, especially in economics, productivity is taken to be synonymous with labour productivity. This is because it is a simpler concept to estimate and it is a rough measure of the effectiveness. However, it is noteworthy that productivity is not determined by the efforts of labour alone, but in combination with land, capital, technology, management and even the environment. Partial Factor Productivity is calculated by dividing the output by one of the factors of production, as shown:

$$PFP = \left(\frac{output}{one\ of\ production\ elements}\right) X\,100 \qquad (2)$$

The list of measurements are incomplete insofar as single productivity measures can also be defined over intermediate inputs, and labour-capital multifactor productivity can be evaluated on the basis of gross output. However, these measures of labour and capital productivity, and multifactor productivity measures (MFP), either in the form of capital-labour MFP, based on a value-added concept of output, or in the form of capital-labour-energy-materials MFP, based on a concept of gross output.

Appendix (C) contains guides to some productivity measures, the five most widely used productivity concepts. They point out major advantages and drawbacks and briefly interpret each measure.

Productivity enhancement remains crucial to the drive for rapid industrialization and economic growth in developing countries. The growth literature is definitive on the centrality of productivity improvement to the fostering of growth. Several policy articulations in Libya have placed productivity concerns at their centre. The measurement of productivity in the manufacturing sector will induce overall industrial efficiency in the economy by exposing local firms to competition and thereby improving the allocation of factors across sectors and increasing the value of domestic production.

For the purposes of this study, number of criteria was selected to measure productivity, using data during the period 1997-2010. It is worth mentioning the difficulty of obtaining real data from concerned bodies, especially with regard to real profits and costs. The following section details these criteria.

3. Measuring of Productivity in the Libyan Public Manufacturing Sector

3.1. Performance Measurement of Plan

According to the performance measurement of the plan (tables 1-1, 1-2); (figure 1), the highest proportion was in the metal industry, which was an average of 82.99% across the years mentioned in the study, and 92.818% in 2010. The proportion of actual production to design capacity in the metal industry was 74% in the same year.

On the other hand, data found that the standard of measuring the performance of the plan in the textile & furniture industry was the lowest among all industries, with up to 25.65% on average, this indicates the low performance of the plan in the manufacture of textile & furniture industry, especially if we compare the figures in 2010, where the proportion of actual production to target production was 10.74%. To make matters worse is the ratio of actual production to low energy design, which was only 0.47% in 2008.

Where:

$$performance\ measurement\ of\ plan = \left(\frac{actual\ production\ value}{target\ production\ value}\right) X\ 100 \quad (3)$$

Regarding the rest of the industries, the cement & building materials industry ranked second with 78.7% on average, and it achieved 69% in relation to the proportion of actual production to design capacity. This was followed by the chemical industry, which was 51.92% on average.

The high proportions mentioned above do not necessarily related to improvement in overall productivity in the enterprise. In order to assess, the study will look to measure productivity at the level of industries of the manufacturing sector, as described in the next section.

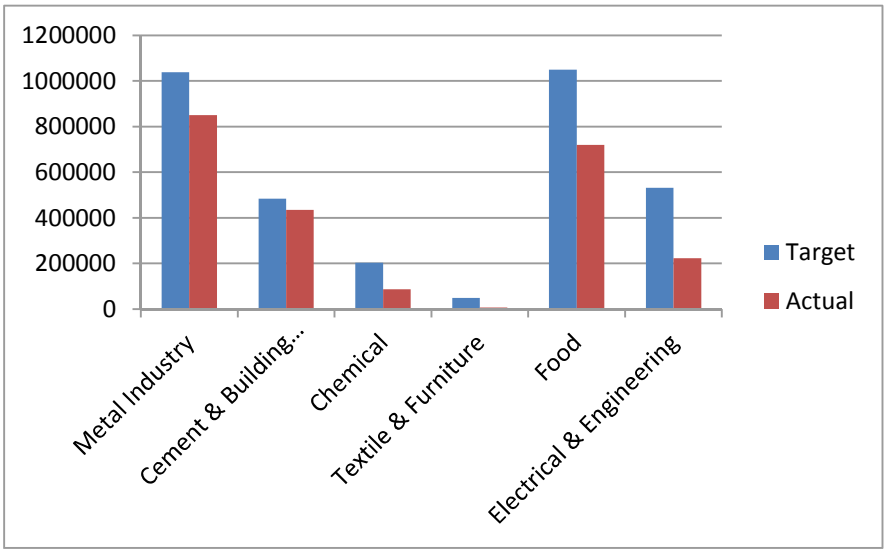

Figure (1) Performance Measurement of Plan Index for the Manufacturing Branches in 2010

3.2. Value Added and Total Productivity (TFP)

I. Metal industry:

Tables (2-1, 2-2) show that the absolute efficiency of production represented in value-added amounted to L.D 1040.37 million in 2010,

it was the highest value during the years of study. This is due to rise in the value of production on one hand and partly to the decline in the value of depreciation on the other. Also, the increase in the value of production was greater than the increase in the cost items.

The high percentages in value added reflected in increases in total productivity (TFP), which reached to 73% in 2010, and 49.9% on average, it was the highest proportion compared to the other branches in the manufacturing sector.

II. Cement and Building Materials Industry:

The rate of total productivity (TFP) in the manufacture of cement and building materials reached to 38% on average during the period 1997-2008, it reached its highest value in 2010 with 55%, after was about 27% in 2006. Policy of increasing production and reducing costs used recently in the factories of Libyan Cement Company for Cement and the Arabian Company led to a slight improvement in total productivity of factories in this branch. However, the increase in the quantity of production in this branch came as a result of increasing the designed capacity of 205.487 million in 2006 to 623,606 in 2010 (Industrial Documentation and information Centre). This reflects the attempt local cement companies meet the demand in the Libyan market, which has led in some cases, to import large quantities of cement from neighbouring countries to cover the deficit in the domestic market.

III. Chemical Industry:

Productivity of chemical industry branch rose from 21% in 2001 to 70% in 2008 due to increase value added by 3.2% and decline costs by 63%. However, this increase was not reflected in real increase in the value of production which rose by a modest value 3%. The real reason in increasing value and the total productivity in this branch is due to the decline in all of the following: decrease the cost of requirements by 67%, decrease the cost of spare parts by 79%, and also decrease the administrative costs by 29.2% (Industrial Documentation and information Centre).

IV. Textile and Furniture Industry

TFP in textile and furniture industry was 25% during the period 1997-2010 in average. decline in design capacity of manufacturers of

textiles and furniture and therefore decrease the quantity of production, in addition to lower prices for produced goods which suffer from the competition of imported goods higher quality led to a fall in production value, impacting negatively on the value added declined from L.D 127 million in 1997 to only 3.8 million in 2010, a decrease of 90%.

Despite the decline in production and employment in this branch, some cost items have risen, for instance, administrative costs rose from 2.6 in 1997 to 3.3 million in 2010, cost of spare parts increased from 0.7 to 1.6 million in 2010, in addition to other costs item which rise from 0.05 to 0.24 million in same period. Nature of the textile industry did not allow the government to increase its productivity growth; this decreased the value of production from L.D 155.756 in 1997 to 58.31 in 2010 by decrease of 96%. Government could not achieve any success with regard to increasing labour productivity and the reason is partly due to the operations of this industry depends on the use of manual labour to a large extent. Despite the reduction of employment, the situation has not improved, but turned to the worse, this calls for developing appropriate policies regarding this unsuccessful industry either by disbanding it or by supporting the right methods to make it a successful industry and not a burden on the government.

V. Food Industry:

Productivity of food industries ranged between 15% and 30% in the period 1997-2010 by 20% in average. Despite the low productivity in this sector, it increased from 15% in 1997 to 30% in 2010, relying on increasing value-added worth 375.2 million resulting from the high production value by 67%.

VI. Electrical and Engineering Industry:

This branch of the manufacturing sector witnessed fluctuations in its productivity percentages which fell from 40.5% in 1997 to 19.4% in 2001, then rose to 69.9% in 2004. Nevertheless, it returned again to decline to reach 18.7% in 2005 which is the lowest level in this study's years.

However, the average productivity during the study period was 32.5%, which is good if comparing with counterparts in some other branches such as food manufacture and textile & furniture.

It remains to point out here that this period witnessed radical and structural changes in the Libyan economy, especially with regard to privatization and the transfer of ownership of some institutions to the private sector. The failure to adopt the right and successful method in privatization process had a negative impact on productivity levels, especially in some of the possessed projects, as well as the inability of the private sector to meet the ownership conditions imposed by the government, which should be acceptable by new owners, where institutions are sold with all its shortcomings and surplus employment.

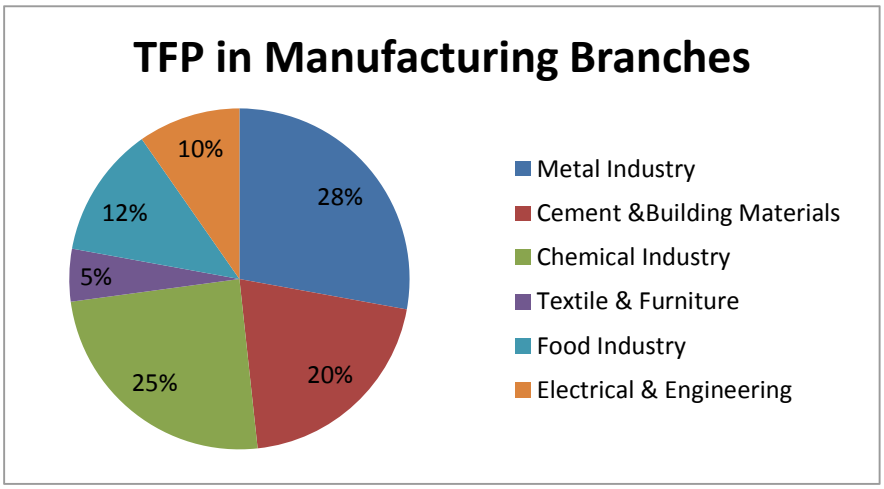

Figure (2) TFP Index in the Manufacturing Branches in 2010

3.3. Partial Factor Productivity (*PFP*)

3.3.1. Labour Productivity

Labour is broader elements used in measuring productivity in Libya, and the most important reasons that led to the use of this element broader than the rest of the other elements was reported by some researchers, include the following (Aziz, 1999):

Several elements use to determine the different productivities, but the most important of these is a labour that is considered an important indicator in measuring productivity, as it constitutes a large part of the cost of goods on one hand, and that can be measured more easily than rest elements on the other.

The importance of labour productivity is coming as superior among the different productivities because it is an important indicator to know the level of real wages and thus to know the overall level of economic welfare.

Factors affecting labour productivity (see Baldwin et al, 2005; Enshassi, 2007; Singh, 1989):

Any element affecting the production or work or the both of them will impact on labour productivity, as these factors can be divided into general factors which labour has no direct role, and to technical factors related to work and labour.

General factors:

Factors related to the availability of raw materials and their quality, the extent of the feasibility of economic policy, seeking to provide terms of productivity growth, degree of interdependence among diverse economic sectors and industries, and availability of food, transport and services for workers. There are other factors related to the age composition of population which increase or decrease the size of labour force and its type and influence the evolution of productivity.

There is also the rate of employment change (labour rotation rate), where productivity being high if this rate was a low and vice versa. In addition to other factors related to climatic conditions within the workplace, affecting the physical capacity of workers such as temperature, sound, ventilation, and other, which would be have a direct impact on productivity.

There is the high wage level that would cause to increase the purchasing capability of workers, therefore increase their demand for goods and products which will have an impact in increasing production. On the contrary, low wages lead to lower purchasing capability of workers and have an opposite effect. In addition to all

these, there are other minor factors that could lead to greater willingness of workers to develop production and increase yields.

Technical factors:

Factors that are usually long-term impact on output and its influence on how to upgrade input and its organization. Therefore, it is worth knowing all the technical factors that affect the improvement of the quality of work, or improve the quality of inputs related to labour element which include the following:

A - Specialization and division of labour: it is either a professional specialization between different professions, or specialization within the same profession.

The specialization within the same profession (technical division of work) is division one work to a number of work parts. The professional specialization and specialization within the same profession both lead to increase the skill of workers and offers the possibility of transmission of the profession to another, or from one part of profession to another.

B - Orientation education and setting: The professional qualification of workers and the preparation of scientific personnel in general are the most important factors that help to increase labour productivity. Individuals could receive the orientation, education and setting in the education sector, either through schools, universities and institutes of vocational orientation and various technical institutes, or directly in factories by providing the necessary information to workers in training courses and specialized programs, in order to understand the fundamentals of work and mastery and the acquisition of new skills commensurate with the development.

C - Organization and rationalization of work: labour productivity can be increased by organizing the effort of workers and regulate the relationship between the worker and the machine through organization of scientific work. Taylor method is considered to be as way of organizing work and rationalized (Haggemann, 1997), this method is purposed to increase output of work comparing with inputs through organization of working methods, as well as through arrangement machinery, equipment and raw materials in the workplace to allow exploited superiorly, and also through determining the time required

to complete each part of the work, and finally through the adoption of a specific wage system based on incentives for workers which linking wages paid and the size of output produced. Wage should be commensurate with the amount of outputs.

D - Using machinery: labour productivity increased as a result reduce the working time necessary to obtain a certain amount of output by using machinery, that previously was required time and strenuous effort by workers. Machinery has also helped to increase the effectiveness of the division of labour, organization and rationalization.

But increasing use of machine has a negative impact as it led to increased unemployment in the short term. However, these negative effects vanish in the long run because the increase in labour productivity and reduce costs lead to an increase in output and a new increase in the demand for workers, especially in the services sector which be more demanding with increasing incomes and rising living level.

Measurement of Labour Productivity in the Libyan Manufacturing Sector:

As already point out that the productivity of labour reflects the relationship between the value of output and labour element, the measures used are as follows (see Smith, 1995; Tawiri, 2000):

• labour productivity per month (in dinars) ***(LPP)***

$$\textbf{labour productivity per month} = \left(\frac{\textbf{value of real production}}{\textbf{average total labour}}\right)/12$$

where

average total labour in a given year =

$$\textbf{average total labour in given year} = \left(\frac{\textbf{labour in the beginning of the year}}{\textbf{labour at the end of the year}}\right)/2$$

• productivity efficiency of labour ***(PEL)***

$$productivity\ efficiency\ of\ labour = \frac{real\ value\ added}{average\ total\ labour}$$

• percentage of skilled labour to production value ***(SLP)***

$$percentage\ of\ skilled\ labour\ to\ production\ value = \left(\frac{average\ total\ skilled\ worker}{actual\ production\ value}\right) X\ 100$$

• average productivity of the dinar of labour shares per month ***(APDL)***

$$average\ productivity\ of\ the\ Dinar\ of\ labour\ shares\ per\ month = \frac{labour\ productivity\ per\ month\ (in\ dinar)}{average\ of\ worker's\ share\ per\ month}$$

where:

average of worker's share per month ***(AWM)***

$$average\ of\ worker's\ share\ per\ month = \left(\frac{total\ salaries\ and\ share\ of\ labour}{average\ total\ labour}\right) /12$$

- **Labour productivity per month (in dinars)** (***LPP***):

This criterion measures the contribution of worker in the value of production per month. As can be shown in the tables (3-1, 3-2) to labour productivity in the metal industry branch has increased by 174.7% during the period between 1997 and 2010, unlike other branches which witnessed different fluctuations in their labour productivity. This means that the productivity per worker in metal industry (in 2008, for example) is L.D 8912.9 per month; this number is relatively large if compared with productivity labour in other sections.

The largest number of this measure was for the branch of food industry, which its labour productivity reached to 10,581.17 in 2008, compared to this, the worst figure was for textile and furniture industry, which saw a large decline in labour productivity, which recorded only L.D 255.34 in 2008, by a decline of 82.89% from 1997.

- **Productivity efficiency of labour (*PEL*):**

This criterion measures the worker contribution to the achievement the value added, the table (3-1, 3-2) show that the productivity efficiency and in metal industry recorded the lowest value in 1999 which scored L.D 29248.46, then continued in increasing till reached 102019.1 in 2008, where the worker contributed to achieve L.D 102019.1.

In the same year, worker in the branch of the cement and building materials industry achieved an added value of L.D 60699.8, it was the third largest number of rest branches after food industry which the worker contributed L.D 75970.87 of value added in 2008.

The worst contribution in 2008 was the contribution of labour in textile and furniture industry, which recorded only 2189.4 after was L.D 23723.6 in 2001.

- **Proportion of skilled labour to production value (*SLP*):**

It equals to invert labour productivity, whenever ***SLP*** a small amount, that was better. This proportion measures what one unit of production requires of labour factor. ***SLP*** continued to decline gradually from 0.0023 in 1999 to reach its lowest level 0.0008 in 2008. Each one unit of output value in 1999 was demanded 0.0023 work unit, and as a result of improved labour productivity in the metal industry led to that the per unit of production became require only 0.0008 of work unit. The same case involving the rest of other branches to a lesser extent except textile and furniture industry which saw a rise in value of ***SLP*** from 0.0056 in 1997 to 0.0326 in 2008. This is a reflection of the lower labour productivity in this branch.

The following tables demonstrate the most important measurements of labour productivity and their analysis in the branches of the Libya manufacturing sector.

- **Average Productivity of the Dinar of the Shares of Labour per Month *(APDL)***

Due to lack of access to data available on some indicators that use to calculate this measure, focusing on 2008 will be base of this analysis (table 4).

Table (4)

Measurement of Labour Productivity in the Manufacturing Sector Branches (2008)

L.D

Branch	*LPP (1)*	*Total Labour (2)*	*TSSL (3)*	*AWM (4) = (3÷2)/12*	*APPL = (1) ÷ (4)*
Metal Industry	8912.97	7944	83954.1	0.88	10.13
Cement & Building Materials	6511.9198	5551	14216.2	0.21	29.8
Chemical	1609.76	4503	18538.8	0.34	4.73
Textile & Furniture	255.34	1903	4408.6	0.19	1.34
Food Industry	10581.17	5660	40040.9	0.59	17.9
Electrical & Engineering	4109.69	4503	23491.0	0.44	9.34

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre.

Note: ***TSSL*** = Total Salaries and Shares of Labour.

3.3.2. Degree of Contribution to Exports:

This criterion measures the extent of contribution of the industrial establishment's export in the all sector exports, the importance of this criterion lies in the fact that it helps to know the branch's contributions export in subsiding the sector and access to foreign exchange, as well as in comparison and evaluation industrial projects according to their importance in the export promotion policy. The most commonly criteria used are as follows (Musa, 1996; Smack, 1997):

$$proportion\ ot\ industrial\ project's\ to\ the\ total\ sec$$

- $$\frac{net\ branch's\ export}{total\ sector's\ export}$$

$$degree\ of\ contribtion\ to\ export = \frac{the\ value\ of\ total\ export}{the\ value\ of\ total\ sales}$$

As shown in table (5) that the metal industry branch is presented the largest contributor to the exports of the manufacturing sector, its contribution was about 85% of total exports of the sector during the years of this study, while the percentage of exports of this section was 35% of its total sales during the same period.

The contribution of the rest of the branches were relatively very low, except the chemical industry which contributed about 26% of the total sector's exports, while the rest of the branches were non-existent in this subject where the cement industry, textile, and food had no exports.

4. Conclusions:

The study showed the decrease in total productivity in most branches of the manufacturing sector and failure to achieve the target annual plans. Important reasons that led to this failure are followed: -Lack of indicators of productivity standards in most of the factories of the manufacturing sector, which led to the failure to take appropriate decisions on planning future productivity. Lack of full awareness of the concept of productivity upon the decision makers in factories led to negative results on the policy of making production plans. Absent of routine and preventive maintenance of production lines resulted in a lack of available production capacity utilization.

Branch of the metal industry scored the best rates of productivity compared with other branches; this section depends on the Iron and Steel Complex, which constitutes about 90% of the production branch of the metallurgical industry sentences.

5.Recommendations:

-We recommend the Ministry of Industry to spread the concepts of productivity to all workers in the manufacturing sector to brief them over the course of production processes.

- Focus on the planning system and pushing it to ensure it successful all the production processes and ensure optimal use of resources and basic elements of production such as labour, raw materials and equipment.

- Contribution of this sector in GDP is limited, therefore, the government should give importance to this sector to contribute the national economy, and to work to increase the degree of productivity in this sector depending on capital intensity and qualified technical employment, and channel investments into this sector to assume its responsibility towards the national economy.

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Table (1-1)

Performance Measurement of Plan Index in the Manufacturing Branches

Branch	**Metal**			**Cement & building Materials**			**Chemical**		
Production	**target**	**actual**	**%**	**target**	**actual**	**%**	**target**	**actual**	**%**
1997	291254.0	237821.0	81.65	195656.0	169876.5	86.82	370816.0	198370.0	53.49
1998	363168.0	248352.0	68.38	198787.0	157654.9	79.30	289742.0	197964.0	68.32
1999	363618.0	258883.0	71.20	200768.0	171137.0	85.24	298754.0	112183.0	37.55
2000	365010.0	269414.0	73.81	210987.0	169876.0	80.51	312349.0	100965.3	32.32
2001	365010.0	279945.0	76.70	216954.0	176954.0	81.56	306780.0	84062.0	27.40
2002	394418.2	290476.0	73.65	227539.7	166543.0	73.19	198876.0	68875.8	34.63
2003	339201.0	280312.0	82.64	280083.0	129686.0	46.30	59970.0	51344.0	85.61
2004	329236.0	335398.0	101.87	281183.0	196006.2	69.70	68934.0	59180.0	85.85
2005	398463.0	413234.0	103.71	254254.0	225185.0	88.56	79693.0	61815.2	77.56
2006	562284.0	510644.0	90.82	118825.0	93718.0	78.87	191062.0	69219.0	36.22
2007	766028.0	686692.0	89.64	449766.0	385360.0	85.68	182068.0	75348.0	41.38
2008	1037999.0	849656.0	81.86	483465.0	433772.0	89.72	203580.0	86985.0	42.72
2009	1120088.0	988992.0	88.29	485800.0	443210.0	91.23	213448.0	86821.0	40.67
2010	1180077.0	1087812	92.18	502009.0	452180.0	90.07	219778.0	87544.0	39.83

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2010.

Table (1-2)
Performance Measurement of Plan Index in the Manufacturing Branches

Branch	**textile & furniture industry**			**Food**			**Electrical & Engineering**		
Production	**target**	**actual**	**%**	**target**	**actual**	**%**	**target**	**actual**	**%**
1997	337143.5	155756.0	46.20	188269.0	93212.0	49.51	287327.0	154605.0	53.80
1998	233145.0	171739.0	73.66	184342.0	104052.0	56.44	263295.0	173691.0	65.96
1999	150716.0	41577.0	27.59	378756.0	199580.0	52.69	303434.0	182179.0	60.03
2000	139604.5	38562.8	27.62	416237.0	192340.0	46.20	335506.0	197732.3	58.93
2001	88493.0	25522.0	28.84	480225.0	174516.0	36.34	305755.0	59086.0	19.32
2002	97381.5	38655.8	39.70	587765.0	228008.8	38.79	331783.0	103359.7	31.15
2003	96270.0	9248.2	9.61	652460.0	253098.4	38.79	356315.0	109773.0	30.80
2004	95158.5	8751.5	9.20	652460.0	297657.5	45.62	222549.0	72354.0	32.51
2005	84047.0	7144.0	8.50	784746.0	322015.0	41.03	15810.9	11287.6	71.39
2006	70905.0	9046.0	12.76	784746.0	360408.0	45.92	476949.0	147327.0	30.88
2007	65885.0	8018.0	12.17	863856.0	549626.0	63.62	538369.0	188109.0	34.94
2008	48682.0	5831.0	11.98	1049318.0	718673.0	68.48	530714.0	222071.0	41.84
2009	50212.0	5845.0	11.64	1128994.0	812386.0	71.95	522897.0	221873.0	42.43
2010	49312.0	5298.0	10.74	1376581.0	901234.0	65.46	508765.0	210987.0	41.47

Source: Industrial Information and Documentation Center, Misurata. Various Production Reports for the years 1997-2010.

Table (2-1)
Total Productivity in the Branches of the Manufacturing Sector

	Metal Industry			**Cement & Building Materials**			**Chemical Industry**		
	Input	***Output***	***TFP%***	***Input***	***Output***	***TFP***	***Input***	***Output***	***TFP***
1997	384022.00	190602.40	50	345395.3	131650.2	38	390475.5	162215.7	41
1998	429852.20	189565.90	44	326931.3	122188.4	37	314171.5	161902.7	51
1999	461669.70	198889.50	43	351120.2	132562.9	37	301202.9	91671.1	30
2000	505505.80	210992.90	42	349862.5	131658.0	37	308520.8	82395.2	26
2001	533191.80	218472.40	41	348681.2	137085.1	39	316705.8	68650.0	21
2002	535192.40	235563.40	44	393063.9	128656.6	32	223962.2	56232.9	25
2003	558312.15	240446.90	43	300522.2	99801.6	33	93072.9	41465.7	44
2004	602723.10	296713.40	49	439419.9	151156.0	34	127768.7	40725.6	31
2005	783106.25	372372.30	48	405828.0	174267.1	42	84880.7	45697.0	53
2006	792330.60	474678.00	60	262064.9	72459.3	27	93796.1	55757.7	59
2007	963038.85	645840.70	67	610583.6	299189.6	49	104284.7	60993.6	58
2008	1193007.19	810440.07	68	664107.3	336944.3	50	116543.2	70907.9	60
2009	1274991.43	910280.41	71	672639.8	355752.9	53	104540.5	77514.7	73
2010	1411041.51	1040377.59	73	738052.9	405402.9	55	104235.8	73080.8	70

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre.

Table (2-2)
Total Productivity in the Branches of the Manufacturing Sector

	Textile & Furniture Industry			**Food Industry**			**Electrical & Engineering Industry**		
	Input	***Output***	***TFP***	***Input***	***Output***	***TFP***	***Input***	***Output***	***TFP***
1997	357421.1	127138.7	46	356228.1	54799.3	15.0	228598.0	92633.0	40.5
1998	361353.4	140137.7	74	396824.7	61290.0	15.0	245463.9	104074.6	42.4
1990	178547.9	33519.5	28	551296.5	118593.5	21.5	259509.5	109112.7	42.0
2000	158363.0	31095.4	28	574585.3	114236.2	19.8	268827.3	118489.4	44.0
2001	111537.4	20639.5	29	573929.2	103528.5	18.0	182417.0	35301.5	19.4
2002	124799.6	31330.8	40	641913.2	135610.8	21.0	264695.9	61826.0	23.4
2003	114525.2	7116.7	10	699973.4	150651.3	21.5	274300.9	65610.1	23.9
2004	124006.9	6851.3	09	1021659.6	177394.5	17.4	61720.3	43121.1	69.9
2005	113708.7	5439.1	09	877206.6	192001.2	21.8	34993.4	6551.6	18.7
2006	86909.7	6901.3	13	954781.8	214944.8	22.5	434074.8	88215.5	20.3
2007	86538.0	5902.9	12	1229036.5	328455.6	26.7	519934.3	112665.4	21.7
2008	79614.4	4166.4	12	1412358.7	429993.4	30.4	556495.9	133112.6	23.9
2009	63368.8	4380.4	13	1438977.0	461053.5	33	601232.8	143154.8	23.8
2010	51773.2	3889.8	13	1552299.8	525218.7	34	642187.7	162315.7	25.7

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre.

Table (3-1)
Measurement of Labour Productivity in the Manufacturing Sector Branches (1997-2010)

Year	Metal Industry			Cement & Building Materials			Chemical Industry		
	LPP	***PEL***	***SLP***	***LPP***	***PEL***	***SLP***	***LPP***	***PEL***	***SLP***
1997	3244.67	31205.37	0.0022	3242.97	30158.7	0.0025	1218.01	11952.23	0.0068
1998	3332.69	30525.91	0.0021	3009.0833	27985.8	0.0027	1334.493	13096.81	0.0062
1999	3172.59	29248.46	0.0023	3265.7863	30356.2	0.0025	838.2876	8220.148	0.0099
2000	3167.04	29763.42	0.0023	3241.1043	30143.2	0.0025	846.286	8287.585	0.0098
2001	3266.42	30589.81	0.0022	2810.9353	26131.4	0.0029	802.2408	7861.887	0.0103
2002	3489.45	33957.53	0.0020	2899.2236	26876.3	0.0028	763.0484	7475.795	0.0109
2003	3383.94	34832.23	0.0021	2497.0348	23059.5	0.0033	677.8623	6569.348	0.0122
2004	3898.71	41388.39	0.0018	4221.724	39068.5	0.0019	966.6144	7982.281	0.0086
2005	4141.45	44783.2	0.0016	6398.0282	59416.0	0.0013	1097.181	9733.115	0.0075
2006	5105.42	56949.97	0.0013	2839.9394	26348.8	0.0029	1295.945	12527.01	0.0064
2007	6849.11	77299.9	0.0010	5830.3074	54319.1	0.0014	1649.764	16025.63	0.0050
2008	8912.97	102019.1	0.0008	6511.9198	60699.8	0.0012	1609.76	15746.82	0.0051
2009	7833.93	90600.0	0.0007	6299.2299	58625.6	0.0012	1668.87	15878.36	0.0043
2010	8462.62	98684.8	0.0005	6731.2933	62660.5	0.0011	1786.90	17004.93	0.0035

Source: Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre.

Table (3-2)
Measurement of Labour Productivity in the Manufacturing Sector Branches (1997-2010)

Year	**Textile & Furniture Industry**			**Food Industry**			**Electrical & Engineering Industry**		
	LPP	***PEL***	***SLP***	***LPP***	***PEL***	***SLP***	***LPP***	***PEL***	***SLP***
1997	1484.23	14538.45	0.0056	1553.84	10962.04	0.0053	1252.07	9002.24	0.0066
1998	1646.71	16124.47	0.0050	1624.09	11479.67	0.0051	1374.70	9884.57	0.0060
1999	606.78	5870.323	0.0137	2750.40	19611.95	0.0030	1520.44	10927.66	0.0054
2000	848.57	8211.086	0.0098	2357.11	16799.44	0.0035	2059.71	14811.18	0.0040
2001	2444.6	23723.61	0.0034	1923.17	13690.62	0.0043	692.04	4961.56	0.0120
2002	2062.30	20058.12	0.0040	2631.68	18782.66	0.0031	1560.38	11200.36	0.0053
2003	421.83	3895.298	0.0197	3011.36	21509.32	0.0027	1707.94	12249.83	0.0048
2004	364.46	3423.947	0.0228	3647.76	26087.43	0.0022	1161.53	8306.90	0.0071
2005	270.85	2474.564	0.0307	3950.91	28268.73	0.0021	189.57	1320.36	0.0439
2006	342.96	3139.797	0.0242	4508.26	32264.31	0.0018	2474.25	17778.21	0.0033
2007	325.30	2873.847	0.0256	7776.26	55764.96	0.0010	3342.38	24022.47	0.0024
2008	255.34	2189.395	0.0326	10581.17	75970.57	0.0007	4109.69	29560.87	0.0020
2009	211.57	2381.156	0.0366	9083.20	65178.96	0.0003	3293.63	23668.61	0.0096
2010	416.91	4412.713	0.0401	10002.34	71789.47	0.0003	3567.97	25642.07	0.0092

Source: Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre.

Table (5)
Contribution of Export in the Manufacturing Sector Branches (1997, 2008)

Industry	Total sales		Exports		Contribution degree in Exports %		% of total sector	
	1997	2008	1997	2008	1997	2008	1997	2008
Metal industry	203030.0	1246565.0	61541.0	554058.0	30.30	44.40	80.00	96.20
Cement & building materials	1009876.6	444707.0	0.0	0.0	0.00	0.00	0.00	0.00
Chemical	198732.3	88393.0	15177.0	21627.0	7.60	24.50	18.50	3.75
Textile & Furniture	143763.6	5906.0	104.6	0.0	0.730	0.00	1.40	0.00
Food	98413.3	728054.0	0.0	0.0	0.00	0.00	0.00	0.00
Electrical & Engineering	169058.5	284437.0	110.0	263.0	0.06	0.10	0.10	0.05

Source: this table prepared by the researcher based on data obtained from Information and Industrial Documentation Centre.