Implications Of Economies Of Scale On The Productivity Of The Garment Industry In Cúcuta

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Abstract

The purpose of this article is to demonstrate how economies of scale reflect a decrease in total unit costs and an increase in investments associated with the clothing industry in Cúcuta through the application of the deductive method with a quantitative perspective and through research based on previous experience that allowed a comparative analysis of the productivity at the level of 70% of its installed capacity, against the level at full capacity in which the total unit costs are reduced and the investments increase considerably according to the calculated volume factors, a situation that is considered as a productivity variable that generates greater competitiveness to achieve a presence in the markets of interest.

Keywords: Economies of scale, volume factor, productivity.

Introduction theoretical

The progress of society and the industry or community in particular is reflected in the different public and private projects that are proposed within the productive system, for which internal alliances are required between the areas of the organization and the set of resources. Applied to them, the productivity and efficiency of infrastructure projects is essential to determine and establish the way in which countries deal with global trends, taking into account the rapid growth of humanity, which generates new needs in the field of openings of new technology new forms of management that guarantee the material and input for the projects and the logistics with which they are handled.

Sustainability is becoming increasingly important in project delivery. Sustainable project management is particularly relevant for infrastructure projects that cause lasting change in the
community and involve multiple stakeholders with different expectations, to carry out a good control of project management, control methods must be applied where it is used to ensure that the project objectives are met, this is where the terms of performance indicators come in, for example, which can measure the results of any type through parameters projects, in this case, infrastructure projects, which are types of negotiations that generally handle quite large budgets, due to the volume of activities and resources that are handled.

Decisions in a company are a systematic and generally predetermined activity, since the way in which both tangible and intangible resources of the organization are used depends to a great extent on them and, therefore, the efficiencies and efficiency of the processes based on them. which deliverables are developed (Díaz & Marrero, 2014) for this reason, decision making represents a critical process on which the interests and even the survival of a company depend (Cruz & Curipallo, 2014); For this reason, the relevance of the provision of a systematic decision-making method that allows to reduce the influence that human biases can have and instead increase objectivity and for this purpose there is the Balanced Scorecard (CMI) (Díaz I., 2015) this will be seen below.

This research was developed following the concepts, for which scientific articles published in databases such as Science Direct, Redalyc, Google Scholar, Scopus and some degree works and books were taken into account, setting as parameters a time range between the year 2012 and 2022; For the articles consulted in the journals, it was verified that the journals that published them were indexed or approved by Publindex at the time they were published by said journals.

Economies of scale depend on market demand, a determining variable of the installed capacity of an industry and the technological alternative in the processes. The higher the production, the total unit costs are reduced and, in turn, more investment is required, an approach that gave origin of the theme of this paper that in the first section conceptualizes the key terms, in the following section it analyzes the situation of the clothing industry in Cúcuta based on the state of the art according to previous experience on research carried out in the sector; In this order, another section shows the results regarding the performance of the installed capacity against the total unit costs and against the investments required in the clothing industry, which are interpreted in the following section called discussion and finally in the last section contains the conclusions regarding the results related to volume factors, market demand and the technological alternatives that should be associated with these industries.

**Economies of Scale**

The underutilization of the installed capacity generates harmful costs that affect the competitiveness and productivity of an industry, since the total unit costs of a produced good increase considerably; the lower the volume produced, the higher the unit cost, variables that have an inversely proportional behavior, in this sense, "the technical-economic relationship of economies of scale in investments in the productive sphere is the result of the relative decrease in cost of capital per unit of production to the extent that the production capacity of investment
projects in the industry increases” (1), performances that correspond to the economies of scale of a production plant. In this order of ideas, it is worth noting that optimal use of installed capacity generates productivity, a concept that corresponds to a "relative indicator that measures the capacity of a productive factor, or several, to create certain goods, so that when Increasing it better results are achieved, considering the resources used to generate them" (2), a situation that in turn generates competitiveness depending on the manufacturing cost at different levels of production capacity, taking into account the concepts of raw materials, inputs, labor and indirect manufacturing costs, which are compared with the installed capacity in units and with the investments involved, a relationship called "technical critical mass" or "volume factor", determined by the following mathematical expression

\[
\frac{P_2}{P_1} = \left(\frac{C_2}{C_1}\right)^{-a}
\]

where:
P: Unit cost of operation ($/u)
C: Plant capacity (units)
a: volume factor

The relationship between cost and capacity is nonlinear.
The relationship of the capacity in units with the investments is directly proportional, the greater the capacity, the greater the investment, as can be seen in the following expression

\[
\frac{I_2}{I_1} = \left(\frac{C_2}{C_1}\right)^f
\]

According to these considerations, a production technology that causes increasing returns generates economies of scale depending on the type of industry at a volume factor (f) determined through the result of multiple observations of projects in progress.

**Situation of the garment industry in Cúcuta**

The clothing manufacturers sector in Cúcuta is operating at an average of 70% of its installed capacity (3) through a production process that is more intensive in labor than in technology, "which has an impact on underutilization of the installed capacity equivalent to 30%, given that the production capacity is to process 14,800 meters of fabric per month, of which 10,400 meters are processed per month at an hourly manufacturing rate of 17.6 garments per hour, an indicator that indicates a low level of productivity”, according to the cited source, these data indicate that the production capacity is equivalent to processing 177,600 meters of fabric per year, but they actually process an amount of 124,800 meters of fabric annually.

Based on these considerations and according to the financial data that appear in the following table taken from the referenced information source, the concepts explained in relation to units produced at a level of underutilization are applied, compared to full installed capacity and its relationship with the total unit costs and investments associated with the clothing industry

**Table 1. Economies of scale in a clothing industry in Cúcuta**
### Concepts

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Level to 70% capacity</th>
<th>Level at 100% capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production capacity in meters of fabric per year</td>
<td>177,600</td>
<td>177,600</td>
</tr>
<tr>
<td>Actual production in meters of fabric per year</td>
<td>124,800</td>
<td>177,600</td>
</tr>
<tr>
<td>Annual production and sales costs</td>
<td>$349'240,000</td>
<td>$575,003,333</td>
</tr>
<tr>
<td>Fixed operating expenses</td>
<td>625'400,000</td>
<td>625'400,000</td>
</tr>
<tr>
<td>Total annual costs</td>
<td>$974'640,000</td>
<td>$1,200'403,333</td>
</tr>
<tr>
<td>Investments (total assets)</td>
<td>695'000.000</td>
<td>$933'655.394</td>
</tr>
<tr>
<td>Total unit costs</td>
<td>$7,809.62</td>
<td>$6,759.03</td>
</tr>
</tbody>
</table>

Source: Own design based on data from Zárate Ocampo, Diego, 2013, Financial impact on SMEs that export clothing from Cúcuta in light of the free trade agreement with the United States, University of Santander, UDES, Master's in Finance, San José de Cúcuta

### Results

Substituting the figures from the previous table in the technical critical mass formulas, the volume factors related to total unit costs and investments at each level of production are determined.

\[
\frac{7.809.62}{6.759.03} = \left( \frac{124.800}{177.600} \right)^{-a} \\
1.15544 = (0.7027)^{-a} \\
1.15544 = 1/(0.7027)^a \\
(0.7027)^a = 0.86547 \\
to \log 0.7027 = \log 0.86547 \\
a = 0.4095
\]

The higher the volume factor (a), the lower the total unit cost, which requires greater production capacity, a performance that can be seen in the following figure.
For investments, the volume factor (f) is determined by substituting the values in the formula
\[
\frac{933'655.394}{695'000.000} = (177.600/124.800)^f
\]
\[
1.363=(1.4231)^f
\]
\[
f=0.8367
\]
Discussion

The competitiveness of the clothing industry in Cúcuta depends on its productive level to achieve a significant presence in the markets of interest, a level established by the installed capacity that must be adjusted to market demand in order to optimize costs and investments in economies, of scale where the volume factor is decisive in the total unit costs and in the investments required by the clothing industry.

By way of illustration, it is worth noting that a specific installed capacity requires a technological alternative according to demand, in other words, a smaller market requires greater intensity in labor than in technologies, generating high total costs and, on the contrary, markets for large size require low labor intensity and more technological investment, which is reflected in lower total costs.

Conclusions

The greater the volume factor (a), the lower the total unit cost, which requires greater production capacity, an inversely proportional relationship.

The greater the volume factor (f), the greater the investment required to achieve greater production capacity, a directly proportional relationship.

Market demand is what determines the optimal installed capacity of the industry and the technological alternative that should be associated with the production process, which reflects lower total and unit costs.

A smaller market requires more labor intensity and less technology, and a large market requires more technology than labor intensity.

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