Business Competitiveness and its Association with Exogenous Factors in Plastic Recycling Companies of the Colombian Caribbean Coast

W. Fong-Silva¹, R. Pitre-Redondo² and J. Chiquillo-Rodelo²

¹ University of Cartagena, GIMIFEC Research Group, Cartagena, Colombia
² University of Guajira, TAMASKAL Research Group, Riohacha, Colombia

Abstract

A statistical association study was carried out between Business Competitiveness and exogenous factors: Commercialization and Environmental Management in plastics recycling companies in the Colombian Caribbean region in 2016. The population studied was 158 companies that recycle plastic waste from the Colombian Caribbean coast. The instrument for gathering information was the IDB's Competitiveness Map for exogenous factors and business competitiveness. The project was carried out in three (3) phases: In the first, the exogenous factors Commercialization and Environmental Management were evaluated by means of a survey to each of the participating companies. In the second, Business Competitiveness was evaluated according to the indicators: Competitive situation of the company with respect to the business sector of recycling of plastic waste, use of competitive strategies and innovation and business improvement. In the third, the independent exogenous variables, were crossed with the dependent variable Business Competitiveness, constructing the bar diagrams of the relationship analysis. The results showed statistical significance at a level of confidence of 95% between the business Competitiveness and the commercialization exogenous factor.

Keywords: Recycling, plastics, competitiveness, significance, commercialization
Introduction

Business competitiveness is understood as fair competition in equal commercial conditions between companies of the same type on the comparative basis of the same services or products with quality, attractive prices, agile and reliable delivery times whose main objective is to win the market generating the confidence of regional, national and foreign clients that allows the company to generate a competitive advantage with its products or services [1]. Some authors consider that within the factors that determine business competitiveness are those associated with commercialization such as prices, costs, product quality and ability to relate efficiently with other companies in the same sector and others related to the improvement of processes such as the incorporation of technological improvements in the production lines and the capacity to promote and support research, technological development and innovation processes (I+D+I) [2, 3].

In the same way there are those who consider that business competitiveness is of a systemic type and is supported by three fundamental axes: The first, related to the systems of innovation and technological development that allow to accumulate technological capacity; the second, related to the creation of productive linkages that promote productive diversification and the third, related to the promotion of quality services supported by technological infrastructure in accordance with the processes of globalization and internationalization of markets that allow increase coverage. Likewise, exogenous factors such as the sophistication of the product market and the external environment affect business competitiveness in one way or another [4]. Business competitiveness must allow the company to organize, anticipate and react to the demands of national and international markets. For this, business flexibility is a key factor since it allows the employer to adapt relatively easily to the changes that are generated and required in globalized markets. For this, companies must be attentive to exogenous factors such as the commercialization of products since from there must define strategies for improvement and development [5].

As an exogenous factor, according to the IDB competitiveness map [6], we find the commercialization of products and / or services, which consists of the link established by the company with its customers and suppliers that allow it to satisfy mutual needs, as well define channels and distribution ways, commercialization strategies, commercial conditions, policies and sales strategies, market studies and customer satisfaction among others [7, 8, 9, 10]. Commercialization is also considered as the activity or process that is carried out to bring the product to the final consumer or target audience, with the goal of increasing business participation in the regional, national or international market [6]. Likewise, the commercialization allows the transit of the finished product from the producer to the final consumer in order to increase the participation of the company in the market with a product that meets the needs and expectations of customers with quality criteria [11].
Environmental management is considered as an exogenous factor since the business responsibility of the new century implies that companies are friendly with their environment where they operate. In this area, a company responsible with the environment implements plans, standards and programs that guarantee conservation and environmental sustainability. It also has residues and waste management policies and applies friendly norms with natural resources [12]. In the same way, taking care of the environment is part of the social and environmental responsibility of the company, which allows it to improve its image before the different social actors [11].

In this order of ideas, the present investigation studied the statistical relationship between business competitiveness and exogenous factors: commercialization and environmental management that could affect the business competitiveness of plastic waste recycling companies in the Colombian Caribbean region.

**Materials and Methods:** Population and sample size: The population participating in the study were 158 companies that recycle plastic waste from the Colombian Caribbean coast, specifically from the departments of Guajira, Atlántico, Magdalena and Bolivar. The sample was 58 companies distributed as indicated in Table 1.

<table>
<thead>
<tr>
<th>Department</th>
<th>Small company</th>
<th>Microenterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guajira</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Magdalena</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Atlántico</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Bolivar</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>17</strong></td>
</tr>
<tr>
<td><strong>Percentage of companies participating in the study</strong></td>
<td><strong>70.7%</strong></td>
<td><strong>29.3%</strong></td>
</tr>
</tbody>
</table>

Note: Classification according to Zevallos 2003 [10].

The number of direct jobs generated by plastic waste recycling microenterprises were in the range of 0 to 10 (0< Number of jobs≤10) while for small businesses they were between 10 and up to 50 jobs (10< Number of jobs≤50). The companies are older than 5 years. To estimate the size of the sample when it comes to a finite population of less than 100,000 individuals is calculated according to Fong et al. (2017) [14] by equation (1): 

\[ n = \frac{\sigma^2 Npq}{e^2 (N-1) + \sigma^2 pq} \]  

(1)

Where: \( n \): Number of elements that the sample must have; \( \sigma \): Level of confidence or risk chosen (95%); \( p \): Probability that an element is selected (50%); \( q \): Probability that an element is not selected (q = p); \( e \): Error allowed (5%); \( N \): Number of population elements.
Variables, phases and reliability of the test: The variables used in the research were classified into two (2) categories (independent and dependent): a. Exogenous independent variables: Commercialization, Environmental Management. b. Dependent variable: Business competitiveness

The exogenous factors were evaluated in 2016, through the instrument designed by the IDB and known as the IDB's Competitiveness Map [8] which consists of sixty-four (64) questions which were modified and adapted to the case Colombian Caribbean region [7, 12, 15, 16, 17]. This instrument evaluates the dimensions: strategic planning (6 questions), production and operations (13 questions), quality assurance (6 questions), commercialization (12 questions), accounting and finance (7 questions), human resources (8 questions), environmental management (5 questions) and information systems (7 questions). For the present investigation, only the exogenous factors were measured: commercialization and environmental management. Business competitiveness was evaluated according to the indicators: Competitive situation of the company with respect to the business sector of recycling of plastic waste (12 questions), use of competitive strategies (12 questions) and innovation and business improvement (12 questions) in accordance with Ibarra et. al and the IDB's competitiveness map [6,15]. In both cases, the instrument was structured according to the Likert scale. Each dimension was assessed on a scale of 0 to 100 points with the following interpretation: Low: 0-60 points and High: 61-100. Two (2) instruments were applied for each of the companies classified in Table 1: one, for the micro-enterprises of plastic waste recycling and the other, for the small plastic waste recycling company.

The research was carried out in three (3) phases: In the first, the exogenous factors commercialization and environmental management were evaluated by means of a survey applied to each of the companies participating in the study according to the classification established in Table 1. In the second, business competitiveness was evaluated according to the indicators: Competitive situation of the company with respect to the business sector of recycling of plastic waste, use of competitive strategies and innovation and business improvement. In the third, the independent exogenous variables were crossed with the dependent business competitiveness, constructing the contingency tables and the bar diagrams of the relational analysis. The instrument was validated for its application in Latin America by the IDB [6]. The internal consistency of the test was determined by Cronbach's Alpha [18], which was obtained by equation 2:

$$\alpha = \frac{k}{k-1} \left(1-\sum_{i=1}^{k} S_{i}^{2} \right) / S_{SUM}^{2}$$

Where: k is the number of test items, $S_{i}^{2}$ is the variance of the items (from 1 ... i) and $S_{SUM}^{2}$ is the variance of the total test. The coefficient measures the reliability according to two terms: the number of items and the proportion of the total variance of the test due to the covariance between its parts (items). This means that reliability depends on the length of the test and the covariance between its items. The coefficient obtained for Cronbach's Alpha by means of equation 2 was 0.88, which is considered as high reliability.
The dependent variable Business competitiveness was classified into two categories: LBC: Low Business competitiveness (scores below 60 points (LBC <60)) and HBC: High Business competitiveness (scores equal or greater than 60 (HBC ≥ 60)). The exogenous independent variables were classified into two categories: a) Low Commercialization (LC) (LC <60 points) and high Commercialization (HC) (HC ≥ 60) b) Environmental Management: Low Environmental Management. LEM (LEM <60 points) and High Environmental Management (HEM) (HEM ≥ 60).

**Statistic analysis:** Initially, business competitiveness was measured using the "IDB Competitiveness Map" instrument [6], which was classified into two (2) categories: Low (0-60 points) and high (61-100 points). Subsequently, the number of cases in low and high category for each of the variables object of the present study was determined to construct the bar diagrams of the relational analysis. Next, the Chi-Square test is evaluated between business competitiveness and exogenous independent variables, determining their degree of statistical association.

### Results and Discussion

According to equation 1, with a confidence level of 95%, a sample size of 58 business is obtained. The instruments were applied for each of the companies classified in Table 1. Small companies (70.7%) and Microenterprise (29.3%). The Chi-Square test was evaluated to analyze the relationship between business competitiveness and independent exogenous variables: Commercialization and Environmental Management.

Table 1 indicates the values of p (statistical significance) where it is observed that there is a relationship of high statistical significance between business competitiveness and commercialization of plastic waste recycling companies (p <0.05). This means that commercialization systems and business competitiveness correspond, that is, it is more likely that a plastic waste recycling company with commercialization strategies tailored to the needs of the customer is a company with high business competitiveness in the markets, checking the postulates of Berumen [2], Martínez and Álvarez [3], Suñol [4], Flores and González [5], Saavedra [6], Aragón et.al [7], Vera and Mora [8], Martinez et.al [9] and Zevallos [10]. In the same way, the results indicate that environmental management and business competitiveness do not correspond (p> 0.05), this means that a company with good environmental management plans and that promotes the sustainability of the environment, is not necessarily a company with high levels of business competitiveness. That is, as well as it may reach high levels of business competitiveness is also very likely not reach them.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Chi Square</th>
<th>GL</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercialization</td>
<td>27.62</td>
<td>1</td>
<td>0.00**</td>
</tr>
<tr>
<td>Environmental Management</td>
<td>1.07</td>
<td>1</td>
<td>0.301</td>
</tr>
</tbody>
</table>
** Relationship with high statistical significance at a confidence level of 95%

Figure 1 shows the relationship bar diagram between the exogenous independent variable and business competitiveness for the Micro and Small Companies studied. It is observed that there is correspondence in the results, that is, both for the Micro and the Small Business a high level of commercialization (44% for the Small business and 41% for the microenterprise) corresponds to high levels of competitiveness. This occurs in almost half of the companies surveyed, which also means that the business competitiveness strategies employed have a positive impact on the commercialization systems used in them, that is, that recycled plastic products reach the final consumer in an agile manner and dynamic. In addition, innovation strategies in terms of presenting new products to consumers have become one of the best commercialization strategies. It is also important to note that one of the best competitiveness strategies that has been giving good results to these companies is their associativity [8] with what they are covering a large part of the regional market. However, they do not have strategies for expansion or growth in the short term.

![Contingency Chart](image)

Figure 1. Joint behavior between Commercialization and Business Competitiveness

Similarly, it is observed that both for Micro and Small Business, low levels of commercialization correspond to low levels of business competitiveness (42% for Small Business and 41% for Microenterprise), additionally checking the statistical significance among the variables. In addition, the low levels of business competitiveness may be due to failed management strategies in research and development that use and directly affect the commercialization strategies of processed products. It is very likely that these companies present problems with commercial policies and distribution channels. In addition, the budget they have for commercialization the products is very limited. It is also observed recycling companies that despite having high levels of commercialization have low business competitiveness (7% for Small Business and 12% for Microenterprise). This may be due to problems of organization and administrative planning as well as very long production cycles and little innovation in new products.
On the other hand it is observed that there are companies that despite having low levels of commercialization present a high business competitiveness (7% for the Small business and 6% for the microenterprise). This can be explained by the fact that some of the companies were in processes of technological updating, which directly affects production volumes, sales, channels and distribution routes.

The statistical significance between the exogenous factor Environmental Management and Business Competitiveness did not result in a significant association (p > 0.05), which means that Environmental Management does not affect the competitiveness processes of plastics recycling companies in the Colombian Caribbean region. It was also not possible to verify that a company responsible for the environment that implements plans, standards, programs that guarantee conservation and environmental sustainability, with waste and scrap management policies and that apply friendly rules with natural resources is not necessarily a company with high levels of business competitiveness, that is to say, it was not possible to verify the approaches of Martínez et.al [11] and Castellanos et.al [12].

**Conclusion**

Based on the analysis as above, it is concluded as follow: There is a statistically significant relationship at a 95% confidence level, between Business Competitiveness and the exogenous factor of commercialization. This means that the business competitiveness strategies employed by these plastic product recycling companies have a positive impact on commercialization systems, reaching the final consumer with new innovative products in an agile and dynamic manner. However, they do not have coverage expansion strategies or short-term expansion. Furthermore, the results allow us to infer that a company with good commercialization plans is very likely statistically to become a competitive company. There is no statistically significant relationship between Business Competitiveness and the exogenous factor Environmental Management at a 95% confidence level in engineering students. This means that Environmental Management is not a statistically determining factor that affects the competitiveness processes of plastics waste recycling companies in the Colombian Caribbean region. In the same way, the results allow us to infer that a company responsible for the environment, that implements plans and programs that guarantee conservation and environmental sustainability, it does not guarantee statistically that it reaches high levels of business competitiveness. Finally, business competitiveness is a complex process that must start by strengthening the internal organizational processes of the company associated with the commercialization of products. This must be carried out in an agile, dynamic, efficient and adaptable way to the external requirements of the globalized economy in which the company operates.
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