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Business Life Expectancy of Manufacturing Sector from Monteria, Córdoba - Colombia

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Abstract
The Sustainable Development (SD) of a community is intimately linked to business. This topic turns out to be of great relevance for the economy and sustainability of a certain territory. Companies provide solutions to different factors that take shape within the company, but its origin and consequences are in all dimensions of the SD. The importance of companies in the SD has been recognized by the UN by making them co-responsible 11 of the 17 Sustainable Development Goals, at least - SDGs (UN, 2015). For a company, life expectancy is determined by the different factors that affect it positively or negatively. This is fundamental. What factors influence the duration of the companies? This document presents the results of an investigation to establish the life expectancy of the manufacturing companies of the city of Monteria, Colombia under the period 2013-2018, based on the analysis of the official data contrasted with a hypothesis and interviews with the actors to determine possible causes and relationships.

Keywords: Business sustainability, Manufacturing, Business lifetime expectancy.

1. Sustainability and Business lifetime

Sustainable development has become an important part. It is a way of life in the longest possible time (Chica Urzola & Benavides Miranda, 2018).
Since the appearance of the first business systems began to observe the possibility of making them durable over time, initially for its ability to generate wealth and later as a possibility to improve the quality of life of all those who integrated it, together with its environment. With time and with the appearance of the report entitled "Limits to Growth" (1972), the physical environmental resource is considered as a restrictive resource that had the possibility of limiting the lifetime expectancy of the business. Starting from this previous moment, the applications and implications of sustainable development begin to be studied within companies and as a result, multiple conceptualizations of the same emerge, derived in their great majority, from the necessary adaptations for their application in each manufacturing system and in its surroundings, which are particular conditions that hinder the generalization of the behavior of the variables that make up the economic, social, environmental and institutional dimensions of the companies and their interaction (Chica-Urzola & Mendoza, 2018). This means that, despite referring to industrial systems of the same type but in different territories, it is not correct to directly compare them and conclude that one company will be better than another only because of differential characteristics of the environment in which each one carries out its activity (Garzón R, Amaya R, & Castellanos D, 2004).

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This is why, as Moldavska and Welo (2017) say, about the multiplicity of existing definitions on the sustainability of manufacturing systems, after several decades of research on this topic, there is still no common definition among academics. (Moldavska & Welo, 2017).

The definitions evolve as the authors modify concepts or interpretations of sustainability in manufacturing systems makes it difficult for industry to take the concept of theory to implementation. The differences between the terms used to define business sustainability can lead to misinterpretations of their true meaning and, therefore, how to implement the concept in the industry (Moldavska & Welo, 2017), Being a real problem when companies decide to take this step.

This problem finds two (2) common points among all the definitions, the first one refers to the need to highlight the influence of the organization's environment as a key factor for its development. The second, that sustainability can be interpreted as the product of a series of joint efforts that lead to the organization remaining productive over time (Garzón R et al., 2004).

The second element in common of the different conceptions of business sustainability, addresses a fundamental idea and is the productive permanence in the time of the organization. As Moldavska (2017) says, in relation to the requirements for an organization or business system to contribute in the field of sustainable development, it is necessary that there be a long-term thinking integrated with short-term actions. It is widely recognized that a long-term perspective is essential for manufacturing organizations (Moldavska & Welo, 2017).

In addition to this, Huang and Badurdeen (2018) recognize some of the advantages that sustainability brings to organizations as a creator of value for long-term stakeholders by taking advantage of opportunities and managing risks in three pillars of sustainability: economic, environmental and social; It can also help boost innovation and long-term success (Huang & Badurdeen, 2018).

On the other hand, The Organization for Economic Cooperation and Development - OECD-, as it is currently known, emerged on September 30, 1961, after showing excellent results administering the resources of the Marshall Plan for the recovery of Europe, then of the Second World War. Colombia was invited by the OECD countries to become a member of this organization on May 25, 2018 (OECD, 2018). Today, this institution is composed of 37 countries, including Colombia, which was admitted to this group of countries after seven years of negotiations and to comply with a series of requirements. The main function of the OECD is to promote public policies that increase the economic and social welfare of the population (Vallejo Zamudio, 2018).

2. Methodology

2.1 Characterization of manufacturing sector from Monteria City

For this stage you go to the official database of the Chamber of Commerce of the city of Monteria. The Chamber of Commerce of Monteria The Chamber of Commerce of Monteria was created by National Decree Number 1276 dated July 17, 1941. Act is governed by the provisions contained in the Commercial Code and its statutes, and is defined as a private institution, with its own autonomy, subject to

surveillance by the Superintendence of Industry and Commerce and affiliated to the Colombian Confederation of Chambers of Commerce, Confecámaras. One of its main functions, granted by decree 410 of 1971, consists of formalizing the creation of companies by registering, registering and issuing the corresponding commercial register. It is this last document that certifies, during its expedition and renewal, that a company is in formal activities specific to its corporate purpose.
The database under analysis is comprised of those companies with a date of creation and enrollment between 2013 and 2018, belonging to the manufacturing sector (that is, their main business activity is classified within divisions 10 to 33 of the International Standard Industrial Classification, Revision 4) and with seat of operations in the Monteria City.

2.2 Hypothesis

In this part, a comparison will be made between the results obtained in the previous stage and those obtained for OECD countries, for the variables:

- Percentage (%) of companies according to their size classification: this variable will show the percentage composition of the manufacturing sector in terms of the companies that comprise it, classified by size.
- Average lifetime expectancy: This variable will measure the number of companies, in percentage, whose active duration or business lifetime is 1 year, 2 years and 3 years.

These variables will be analyzed in the light of the following hypotheses:

- Ho: median1i = median2i - H1: median1i < > median2i
- Ho: median1j = median2j - H1: median1j < > median2j

Where:
Median1i: is the median percentage of manufacturing companies of size i in the city of Monteria.
Mediana2i: is the median percentage of manufacturing companies of size i in the OECD countries.
Median1j: is the median percentage of manufacturing companies that survive a period of time j in the city of Monteria.
Median2j: is the median percentage of manufacturing companies that survive a period of time j in the OECD countries.
i: size of the manufacturing company (micro, small, medium, large)
j: years of survival (1, 2, 3)
Once the preliminary conditions of the corresponding hypothesis tests were established and their assumptions validated, it is determined to perform these using nonparametric tests, particularly the Mann-Whitney W test (Wilcoxon) to compare medians The Mann-Whitney W test to compare the medians of two samples are constructed by combining the two samples, ordering the data from least to greatest, and comparing the average ranks of the two samples in the combined data. This analysis is complemented with the box diagram for the median of each test.

3. Results

3.1 Characterization of the manufacturing sector from Monteria City

The first results show that in the manufacturing sector of the Monteria City, during the years 2013-2018, 221 companies registered as new companies. Of these companies, 94.11% are classified as microenterprises, 5.55% as small, 0.34% as medium and none as large companies (Table 1).

Table 1. Manufacturing companies Monteria city, period 2013 - 2018

Year	Large Companies (T>250)	Medium Companies (50<T<249)	Small Companies (9<T<49)	Micro Companies (T<9)
2013	0,00%	0,00%	8,00%	92,00%
2014	0,00%	0,00%	13,16%	86,84%
2015	0,00%	0,00%	0,00%	100,00%
2016	0,00%	2,04%	6,12%	91,84%
2017	0,00%	0,00%	2,44%	97,56%
2018	0,00%	0,00%	3,57%	96,43%
Promedio	**0,00%**	**0,34%**	**5,55%**	**94,11%**
T: Number of Workers				

Source: Author

As can be seen, the vast majority of formally created manufacturing companies are classified as micro-enterprises, making this city a micro-entrepreneurial territory, which can affirm that 9 out of 10 manufacturing companies created correspond to this segment. This situation is shared with some OECD countries, which handle similar averages of microenterprises, such as Australia (94.41%), Turkey (97.19%) and the Czech Republic (89.21%).

Also noteworthy is the small number of small and medium-sized companies created during this period, which, in terms of Sustainable Development, has an implication in the socio-economic impact of the territory. In the same order of ideas, it can be characterized as alarming the fact that between the years 2013 to 2018, not a single large company has been created.

In contrast to the values obtained in the city of Monteria with the OECD countries, it can be seen that the averages of manufacturing companies classified by size (Table 2) have an important difference. On the other hand, regarding the values of the micro and small companies, there is a greater proximity to the minimum values of the OECD countries, which correspond to those offered by Turkey. With regard to medium and large companies, a situation similar to the previous one is presented, but with the values of Greece, which in turn correspond to the minimums of the OECD countries for these categories.

Table 2. OECD manufacturing companies

	Large Companies (T>250)	Medium Companies (50<T<249)	Small Companies (9<T<49)	Micro Companies (T<9)
MAX	2,47%	9,62%	90,20%	97,19%
MIN	0,17%	0,00%	1,02%	6,98%
AVERAGE	0,77%	3,38%	22,37%	66,52%
T: Number of Workers				

Source: OECD database (2017)

As for the composition of the manufacturing sector by the divisions that make it up, according to the economic activity and determined by the International Standard Industrial Classification, Revision 4 (ISIC4), to this sector correspond the divisions from 10 to 33. This is how It is observed that the main manufacturing line is the food production industry (division 10), with 21.72% of the total manufacturing companies in the city of Monteria. Followed by the sector of maintenance, installation and specialized repair of equipment and machinery (Division 33), with 17.65% of the business participation. From there, we find that the other sectors have a very low participation, all below 10%, and there are even some sectors with total absence of participation, which indicates that there are no companies dedicated to that economic activity in the city.

Table 3. Manufacturing companies by division

MANUFACTURING SECTORS	%
Division 10. food products.	21,72%
Division 11. Production of beverages.	4,07%
Division 12. Manufacture of tobacco products.	0,00%
Division 13. Manufacture of textile products.	1,81%
Division 14. Manufacture of clothing.	7,69%
Division 15. Tanning and retanning of hides.	0,45%
Division 16. Manufacture of wood and cork products.	7,24%
Division17. Manufacture of paper, cardboard and products of paper and cardboard.	0,00%
Division 18. Activities of printing and production of copies from original recordings.	5,43%
Division19. Coquization, manufacture of petroleum refining products and fuel mix activity.	0,00%
Division 20. Manufacture of chemical substances and products.	3,62%
Division 21. Manufacture of pharmaceutical products.	1,36%
Division 22. Manufacture of rubber and plastic products.	0,00%
Division 23. Manufacture of other non-metallic mineral products.	4,52%
Division 24. Manufacture of basic metallurgical products.	1,81%
Division 25. Manufacture of fabricated metal products, except machinery and equipment.	8,14%
Division 26. Manufacture of computer, electronic and optical products.	0,90%
Division 27. Manufacture of electrical equipment and equipment.	2,71%
Division 28. Manufacture of machinery and equipment n.c.p.	1,36%
Division 29. Manufacture of motor vehicles, trailers and semi-trailers.	0,90%
Division 30. Manufacture of other types of transport equipment.	0,45%
Division 31. Manufacture of furniture, mattresses and mattresses.	4,98%
Division 32. Other manufacturing industries.	3,17%
Division 33. Installation, maintenance and specialized repair of machinery and equipment.	17,65%

Source: Author

On the other hand, when the classification is made according to the average lifetime expectancy of the companies (Table 4), it is found that 19.91% of the companies had a half-life of no more than one (1) year; 23.98% a half-life greater than one (1) year but not more than two (2) years. It is important to note that only 14.48% of manufacturing companies manage to survive the first five (5) years, which is to say that 85.52% of companies in this sector have a lifetime expectancy not higher to this period of time.

Table 4. Average lifetime expectancy of manufacturing companies in the Monteria City, years 2013 - 2018

SURVIVAL RATE	%
1 Year	19,91%
2 Years	23,98%
3 Years	21,27%
4 Years	11,31%
5 Years	9,05%

Source: Author

3.2 Hypothesis testing

The first hypothesis to validate corresponds to the contrast of the composition, in relation to the size of the companies, that structure the manufacturing sector of the city of Monteria in contrast to the OECD countries. The general information of these two groups can be seen in tables 1 and 2.

The results of the test of Mann-Whitney W test (Wilcoxon) to compare medians for each of the business segments, classified by size as micro, small, medium and large company, which structure the two groups can be seen in the table 5.

Table 5. Comparison of Medians for each of the sizes of companies in the manufacturing sector.

MICRO	**SMALL**	**MEDIUM**	**LARGE**
Sample median 1: 0.942	Sample median 1: 0.0485	Sample median 1: 0.01	Sample median 1: 0.0
Sample median 2: 0.658	Sample median 2: 0.167	Sample median 2: 0.028	Sample median 2: 0.006
Average range of sample 1: 39.1667	Average range of sample 1: 7.0	Average range of sample 1: 5.33333	Average range of sample 1: 3.5
Average range of sample 2: 19.2162	Average range of sample 2: 24.4324	Average range of sample 2: 24.7027	Average range of sample 2: 25.0
RESULTS			
W = -103.0 P-value = 0.000326929	W = 90.0 P- value = 0.00170439	W = 100.0 P-value = 0.000475324	W = 111.0 P-value = 0.0000988435
The null hypothesis is rejected for alpha = 0.05.	The null hypothesis is rejected for alpha = 0.05.	The null hypothesis is rejected for alpha = 0.05.	The null hypothesis is rejected for alpha = 0.05.
* sample 1: Percentage of companies of evaluated size of the manufacturing sector of the Monteria City * sample 2: Percentage of companies of evaluated size of the OECD manufacturing sector			

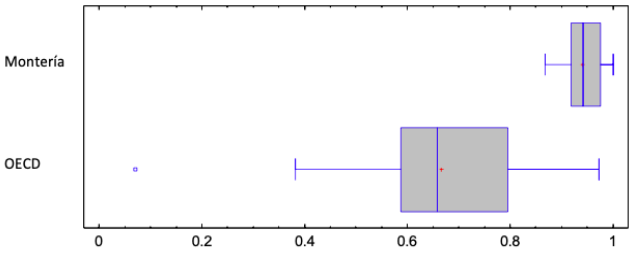
Source: Author

As can be seen, in all cases the null hypothesis (Ho) is rejected, indicating that if there is a difference between the medians of each of the percentage participations by size, which make up the manufacturing sector of the city of Monteria in contrast to the same sector of the OECD countries.

With regard to microenterprises, it can be said that the manufacturing sector in both the city of Monteria and the OECD countries are constituted mainly by companies of this size, but that the percentage of these is much higher in the city of Monteria. This difference allows us to infer that 9 out of 10 companies in the manufacturing sector of the city of Monteria are micro-enterprises; while for this same segment in the OECD countries, the ratio is close to 2 out of every 3; some OECD countries with values similar to those of the city of Monteria, where a similar inference can be made of 9 out of 10 manufacturing companies that belong to this sector, such as Australia and Turkey.

There are also countries where this proportion is reversed, as is the case in Luxembourg, where the percentage of manufacturing microenterprises is close to 7%. Figure 1 shows this phenomenon when observing the distance between medians and their position with respect to the total percentage of companies (x- axis).

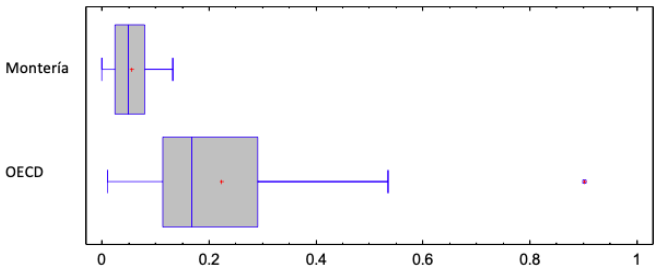
Figure 1. Box and Whisker plot. Monteria vs. OECD countries micro company



Source: Author

In the case of small companies, it is interpreted that in the OECD countries there is a considerably greater participation of these in the composition of the sector, with respect to the city of Monteria. As shown in Figure 2, it can be inferred that the participation of small businesses in the manufacturing sector of the OECD countries is close, almost four times, the same in the city of Monteria.

Figure 2. Box and Whisker plot. Monteria vs. OECD countries small company



Source: Author

A situation similar to that of small businesses, can be seen with medium and large companies. In these cases, there are also percentages of participation in the business structure of the sector, higher in the OECD countries with respect to the city of Monteria. This phenomenon could have as a probable cause the economic and industrial policy of the OECD countries, which favor the creation and support of companies of this type or the strengthening and impulse for microenterprises to evolve and develop, increasing in size with time.

The second hypothesis that was validated, aims to establish whether the fraction of companies that have an average survival expectancy, or average survival time, between 1 and 3 years is the same or there is a statistically significant difference. In order to test this hypothesis, the data associated with this variable were used to generate table 1, for the Monteria City and for the OECD countries, the data acquired through the database of

business demographic indicators of it is (SDBS Business Demography Indicators -ISIC Rev. 4-.), which by their extension are not copied in this document. For purposes of the validation of this hypothesis, the lifetime or survival of the companies will be defined as the time in which a company performs the activities for which it was formally created, starting with its formalization through registration and commercial registration in the Chamber of Commerce of Monteria or its equivalent for the countries of the OECD, until its completion, equally formalized before competent institution, of economic activities.

The results of the test of Mann-Whitney W test (Wilcoxon) to compare medians for each of the business segments, classified by the survival time for the first three (3) years, which structure the two groups can be seen in Table 6.

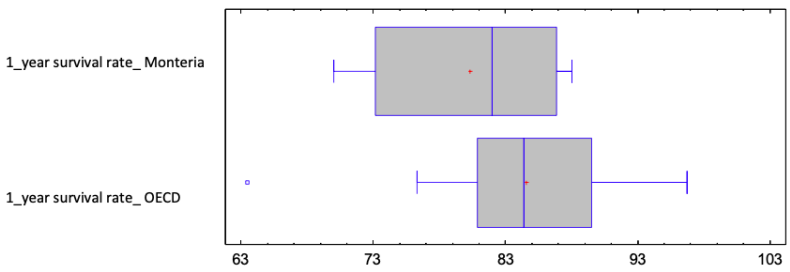
Table 6. Comparison of Medians of the percentage of manufacturing companies that survive the first three (3) years.

1-YEAR SURVIVAL RATE	2-YEAR SURVIVAL RATE	3-YEAR SURVIVAL RATE
Sample median1: 82.005	Sample median1: 56.796	Sample median1: 37.0605
Sample median2: 84.4	Sample median2: 70.5	Sample median2: 62.8
Average range of sample 1: 12.3333	Average range of sample 1: 5.16667	Average range of sample 1: 3.66667
Average range of sample 2: 16.88	Average range of sample 2: 18.6	Average range of sample 2: 17.9565
RESULTS		
W = 22.0 P-value = 0.282374	W = 65.0 P-value = 0.00125699	W = 68.0 P-value = 0.000278562
The null hypothesis is not rejected for alpha = 0.05.	The null hypothesis is rejected for alpha = 0.05.	The null hypothesis is rejected for alpha = 0.05.
* sample 1:% of companies in the manufacturing sector of the Monteria City that survive the year j * sample 2:% of companies in the manufacturing sector of the OECD countries that survive the year j * j = 1 year, 2 years, 3 years		

Source: Author

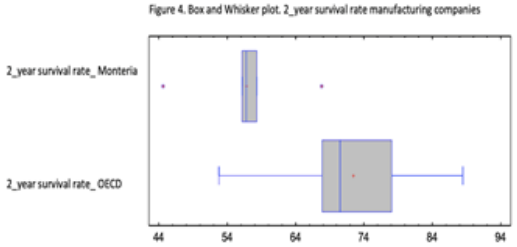
As can be seen in Table 6, we can infer, because the P-value is greater than or equal to 0.05, that there is no statistically significant difference between the medians of the fraction of companies in the manufacturing sector that survive the first year of activities, both in the city of Monteria and in the OECD countries, as shown in figure 3.

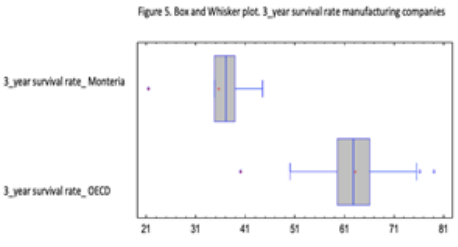
Figure 3. Box and Whisker plot. 1_year survival rate manufacturing companies



In addition, it can be said that, in both cases, the survival rate is high since more than 80% of these survive, which indicates that approximately 5 out of 6 manufacturing companies that enter into operation have chances of surviving this period. In turn, 1 in 6

(about 16%) has the possibility of not completing its first year of activities.
In contrast to the above, for the second and third year of survival, it can be inferred, because the P-value is less than 0.05, that there is a statistically significant difference between the medians with a confidence level of 95.0%. and, in the same way, in both cases the median of survival is lower for companies in the city of Monteria, which indicates that the fraction of manufacturing companies that survive these periods of time since their start of activities is less than the fraction of companies in the same sector for the OECD countries.
For the particular case of the 2-year survival period, it can be inferred that, while 7 out of 10 manufacturing companies in the OECD countries survive (figure 4), in the city of Monteria only a little more than the half, that is a little more than 56%.





A more extreme case happens for the first three (3) years of lifetime (figure 5), where in the OECD countries about 63% of the manufacturing companies survive, that is, almost 2 out of every 3; in the city of Monteria, only about 37% of these manage to do so, that is, a little more than half of those in the OECD countries.
In any case, we cannot ignore the fact that at this point, in the race for corporate sustainability, about 65% of the manufacturing companies in the city of Monteria have already perished.

4. Conclusions

It can be concluded that the manufacturing sector in the city of Monteria is mostly made up of micro-enterprises, that is to say, companies that have at most 9 employees. In contrast, the almost null participation of medium-sized companies and the absence of large companies created during the study period are highly worrisome.
In relation to the business survival of the manufacturing sector, it has a survival rate of 14.48% which is considered low, since it is equivalent to say that less than 1 company out of 5 created in this sector, has a chance of survival.
When the previous figure is appreciated, from the other side of the coin, it can be considered quite discouraging for the creation of manufacturing companies, that there is a prospect of closing activities before the first five years, of 85.52%. This, in addition to discouraging, can be considered as one of the causes of the prevalence of microenterprises as a majority component of the manufacturing sector, since by having low amounts in total assets, the time of recovery of the investment can occur, with greater probability, in short periods of time or, in case of not reaching the equilibrium

point, an economic loss not very large for its shareholders.

Regarding the comparison of the composition of the manufacturing sector in relation to the size of the companies that structure it, it can be concluded that although both the OECD countries and the city of Monteria can be considered as mostly microenterprise, the differences in the levels of participation of these companies in structuring the sector are important, placing the city of Monteria well above most of the OECD countries.

About the lifetime expectancy of the manufacturing companies of the city of Monteria, it can be concluded that, in relation to the first year of survival, it is expected that about 82% will achieve this goal, a situation that does not differ much from the fraction expected for the OECD countries. For the second year of survival, the situation changes as the hope for companies that reach this milestone is greater in the OECD countries, marking an important difference with the city of Monteria, where hope is substantially reduced, reaching to about 50%. This situation is accentuated when one looks at the hope of survival of the third year, where the distances between the two groups increase, and there is a very low hope for Monteria companies, where a value of just over 1 of each is reached. 3.

It is recommended to carry out studies that allow to determine the causality of this situation and thus be able to elaborate improvement strategies.

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