CLUSTERING DYNAMICS WITHIN THE CULTURAL INDUSTRIES IN CALI, COLOMBIA

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ABSTRACT
The main objective of this paper is to provide relevant information, from a microeconomic perspective, for the decision making process followed by entrepreneurs interested in being part of the cultural industries (IC) in the city of Cali, Colombia. To that end, we will make use of a data clustering technique and the Herfindahl Index, to measure the dynamics of agglomeration within the IC, according to their absolute and average sales volume, the concentration of market power and the number of employees hired in average by each cultural subsector. We found that there is a strong asymmetry in the distribution of quotas within the majority of cultural activities and a clear division of clusters of cultural subsectors whose behavior is similar for each variable analyzed.
KEYWORDS: Cultural industries, economic census, clustering, dendrograms, concentration.
JEL CLASSIFICATION: O47 and Z11

1. INTRODUCTION
In recent years, cultural industries have been gaining the attention of scholars, policy makers and investors. The new staging of these industries can be explained on the one hand, by the increasing interest in the "new economy" and the different ways to generate value under this new economic structure, based on creativity. On the other hand, because of the potential employment generation and income redistribution that could rise from a predominantly "creative and talent" intensive sector.

The municipal government of Santiago de Cali has not neglected this global trend and has adopted, as one of the most important economic development policies, the encouragement of the production of the Cultural Industries (hereafter IC). This is the reason why the IC have become one of the strategies of economic growth of the city, and its selection as one of the growth engines at the municipal level has not been an isolated decision: many national actors have been interested in this type of industry mainly because being intensive in human capital, the IC have large redistributive effects on income. In fact, the recent interest in these industries was clearly reflected in a document of the National Council of Economic and Social Policy (CONPES by its Spanish acronym) issued by the National Planning Department (DNP by its Spanish acronym) in April 2010, in which the government presented the national policy guidelines for the promotion of the IC in the country, as the same time as recognized its great potential.

Despite the interest in the IC, the information available from the sector is relatively low, both at national and municipal level: there are some measurements of the size of the IC driven by Andrés Bello Convention (CAB by its Spanish acronym), but only at a country level. Some other studies have been conducted to specific sub-industries or present an overview of the industry, although most of them are more qualitative than quantitative (see Zuleta and Jaramillo, 2003; British Council et al., 2002; CAB, 2003). Also, academic studies on IC in Latin America are scarce. The novelty of the concept of cultural industries, but also the existing limited information about the sector make even more difficult the entrepreneurial efforts and the creation of initiatives for the construction and evaluation of public policies at the municipal level in Latin America.

In the case of Cali, there are some recent studies such as Alonso, Gallego and Ríos (2010) which provides a measure of the weight of the cultural industries in the municipal GDP. Alonso, Bernat, Bermudez, Ramírez, Ríos and Villarraga (2010) presented a system of indicators to monitor the cultural economic activities in Cali. Finally, Alonso and Ríos (2011) presented an analysis of market structures of the subsectors of the cultural industries, together with an analysis of the dynamics of the concentration of production within the year. These studies confirm that the IC are important generators of added value in Cali and a source of great economic linkages, at the same time that represent great business opportunities for entrepreneurs.

In terms of gross sales in Cali, formal enterprises whose economic activities could be classified as cultural industries generated about 482 billion pesos in annual sales in 2006 (current prices), 527 billion in 2007 and 522 billion in 2008. Which means that their shares of the total gross sales generated by all economic activities in the city was 1.07%, 1.01% and 0.93% each year. In terms of generating added value, the municipal share of GDP of the IC was 1.22%, 1.01% and 1.04% for 2006, 2007 and 2008, respectively (see Table 1). These numbers show that, in effect, the generation of added value was very similar to the production of traditional sectors of the economy in Cali as *Hotels and Restaurants*, and even higher than sectors as influential as the *Financial Intermediation and Financial services*.

Table 1: Share of GDP in Cali

ECONOMIC ACTIVITY	2006	2007	2008
Cultural Industries	1.22%	1.01%	1.04%
Manufacturing industries	21.23%	22.48%	24.35%
Hotels and Restaurants	1.64%	1.54%	1.74%
Financial Intermediation	0.77%	0.55%	0.71%
Construction	22.22%	28.10%	30.65%
Real Estate Services	23.26%	23.18%	24.63%
Transport and communications	9.87%	9.42%	9.65%
Trade	12.33%	13.25%	12.51%

Source: Own calculations with data from the Directorate of National Taxes and Customs of Colombia (DIAN).

The aim of this paper is to continue studying the behavior of the IC in Cali in order to provide more information to entrepreneurs in the city and at the same time, to supply a framework for studying the dynamics of change in the distribution of market shares inside the IC in recent years. This document responds to the need of making visible the differences and similarities of the subsectors within the IC, important aspects when undertaking entrepreneurial and policy decisions. To achieve this goal, we will be use dendrograms (tree diagrams) to identify the cultural subgroups that behave similarly with respect to production variables. The analysis is complemented by the use of the Herfindhal-Hirschman Index (HHI hereafter), one of the indicators traditionally used to monitor sales concentration, in order to measure the competition within the IC in the municipality of Cali.

This document is organized as follows: In the second part there is a brief definition of cultural industries and the subsectors that are being studied. In the third part we describe the methodology, the graphical tools and procedure for calculating the concentration index. The fourth part discusses the data used and displays the results of the calculations. The last section presents a final discussion of results.

2. DEFINITION OF CULTURAL INDUSTRIES AND SUBSECTORS

For purposes of this paper, we have adopted the UNESCO definition on the concept of Cultural Industries. That is, the IC corresponds to "those that produce creative and artistic tangible or intangible, and have the potential to create wealth and generate income through the exploitation of cultural assets and production of goods and services based on knowledge (both traditional and contemporary)" (UNESCO, 2007, p. 11).
However, to operationalize the concept of IC in the development of our calculations, it is important to adopt a more specific definition as the one provided by the methodological guide of the Andrés Bello Convention (2009)[1], according to which the categories of Industrial Code (ISIC hereafter) that are part of the IC are:

Table 2: Activities considered as part of the Cultural Industries

ISIC	ECONOMIC ACTIVITY
2211	Publishing of books and other publications
2212	Publishing of newspapers, journals, etc.
2213	Publishing of recorded media
2240	Reproduction of recorded media
3694	Games and toys
5244	Retail sales of books, periodicals, materials and stationery and desk
6423	Transmission services of radio and television programs
6424	Cable transmission services
7320	Research and experimental development on social sciences and humanities
7430	Advertising
7494	Photographic activities
9211	Production and distribution of films and videotapes
9212	Exhibition of films and videotapes
9213	Radio and television activities
9214	Dramatic arts, music and other arts activities
9219	Other entertainment activities n.e.c
9220	News agency activities
9231	Library and archives activities
9232	Museums activities and preservation of historical sites and buildings
9233	Activities of botanical and zoological gardens and national parks

Source: Alonso and Gallego **(2010b).**

3. METHODOLOGY AND DATA

The grouping or clustering analysis is a statistical technique commonly used in data analysis, that allows the classification of a set of observations (e.g. sales of cultural subsector) in subgroups of observations that tend to be similar, the so-called clusters. The idea behind of this type of grouping is that the observations within a cluster are as similar as possible to each other, while there are clear differences from one cluster to another. A cluster analysis applied to production / sales of the IC is particularly interesting as it allows i) to determine those most similar subsectors and the most diverse within the industry and ii) in the event of any information, monitor how clusters evolve over time when possible.

Dendrograms or tree diagrams are one of the simplest tools that allow the graphic visualization of the observations grouped at different levels (see for example Lee, 2004). In our case, the cultural subsectors are grouped according to their sales in absolute terms, their average sales, the intensity of competition and the

1 The international institution Andrés Bello in 2009 produced a methodological manual for the implementation of satellite accounts of culture in Latin America.

number of employees. The clusters are built from the successive division of the subsectors according to a pattern of dissimilarity marked by the most extreme observation, for example, the subsector with the highest sales (or smaller sales depending on the needs of the study). The sequential formation of clusters results from the comparison of successive sales of the other subsectors and its proximity to the "dissident" subsector.
The analysis of agglomeration was complemented by calculating the Herfindahl-Hirschman Index (HHI hereafter), one of the indicators traditionally used for measuring concentration, for each cultural sub-sector (see Alonso and Rios, 2011 for further discussion). The main objective of this index and of the concentration indexes in general, is to synthesize into a single number the characteristics associated with the structure of a market or industry[2]. Hence, the HHI will allow us to measure the relative importance of the companies that are part of the IC and in that sense, determine whether it is possible or not that some of them exercise considerable control over prices and sales within each subsector. HHI formally corresponds to:

$$HHI = \sum_{i=1}^{n} S_i^2$$

Where Si represents the share of sales of the firm i from the total industry sales, otherwise, the market share of firm i. The HHI takes the value 0 when there is no production, 1/ N when the participation of all companies is the same (perfect competition) and when the concentration is extreme, as in the case of monopoly, the HHI approaches to one (or 100% in percentage terms). To interpret the results we adopt the classification of the Federal Trade Commission and the Department of Justice of the United States[3], entities that have defined that the threshold below which an industry is considered as unconcentrated corresponds to an HHI of 0.15, moderately concentrated as it is between 0.15 and 0.25 and highly concentrated when the HHI lies above 0.25.
For our analysis of clustering and concentration, we use the information on total sales revenue in millions of pesos contained in the statements of the Value Added Tax (VAT hereafter) of the Directorate of National Taxes and Customs of Colombia (DIAN by its Spanish acronym) for the years 2006, 2007 and 2008. While the data base from the DIAN restricts the analysis only to formal enterprises that declare VAT, the data bases are regularly updated, reliable and possibly audited, unlike other databases that might contain this information for the city of Cali. The sales revenue in this database is discriminated by economic sectors following the classification of four-digit ISIC, which allows a detailed analysis by cultural subsector. However, it should be noted that a disadvantage of this database is the possible tax evasion and avoidance that may exist in the cultural industries sector in the city of Cali. On the other hand, to the grouping of sectors according to the number of workers they hire, we will use the information contained in the Economic Census Cali-Yumbo (CECY by its Spanish acronym) conducted by the National Bureau of Statistics of Colombia (DANE by its Spanish acronym) in 2005.

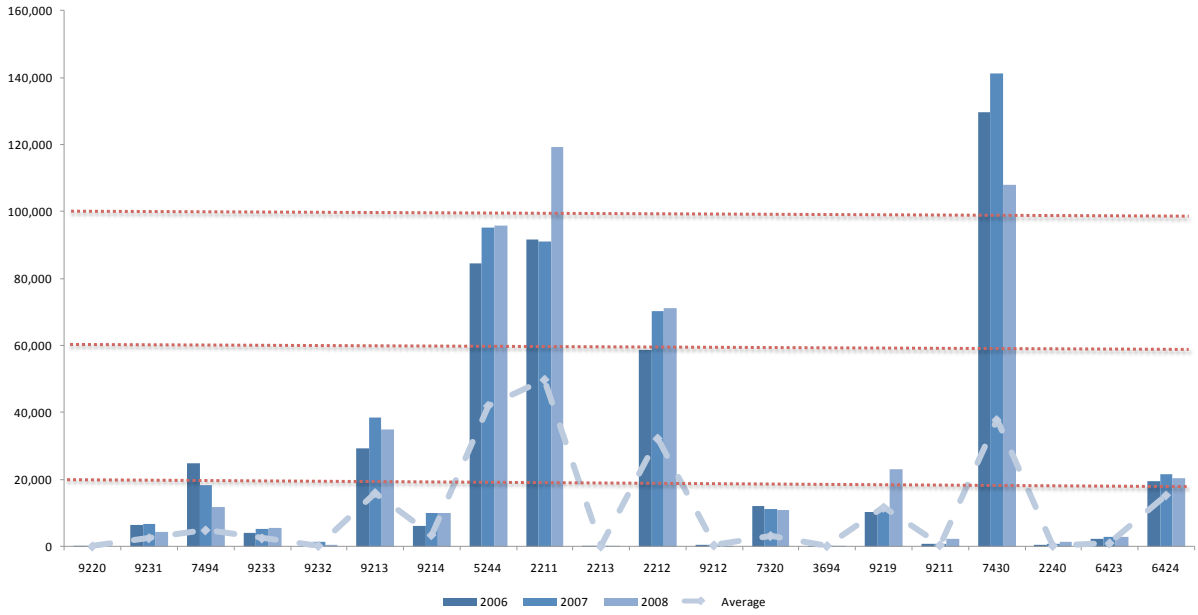
4. RESULTS

4.1. Clustering by similarity in sales volume

The important dynamics of the IC in Cali have meant the consolidation and enhanced the potential of several sectors subscribe to this classification. This was the case of the cultural subsector *Advertising* (ISIC 7320), which annual sales were over $100,000 million pesos translated into a established sales participation on total revenue of the IC of 26.87%, 29.75% and 20.63% for 2006, 2007 and 2008, respectively. Other sub-sectors also showed significant sales between $60,000 and just over $100,000 million pesos, including *Publishing of books and other publications* (ISIC 2211) with 19%, 17.27% and 22.83% of total output of the IC and *Retail of books, periodicals, materials and stationery and desk* (ISIC 5244), a sector that presented shares in the order of 17.55%, 18.07% and 18.34% for each year observed.
However, despite that the sector's growth prospects are encouraging, we can see that the distribution of annual sales of IC in Cali has a strong asymmetry (see Figure 1), primarily because it is easy to see that only 4 cultural subsectors present cultural sales over $ 60,000 million annually, while many of the subsectors recorded sales less than $ 20,000 million pesos in the same amount of time. This permits one to conclude that there are at least two defined subgroups of associated economic units that share similarities in production.

2 See e.g. Curry and George (1983) for a discussion of the various indices.
3 For further information on legislation, see FTC (2010).

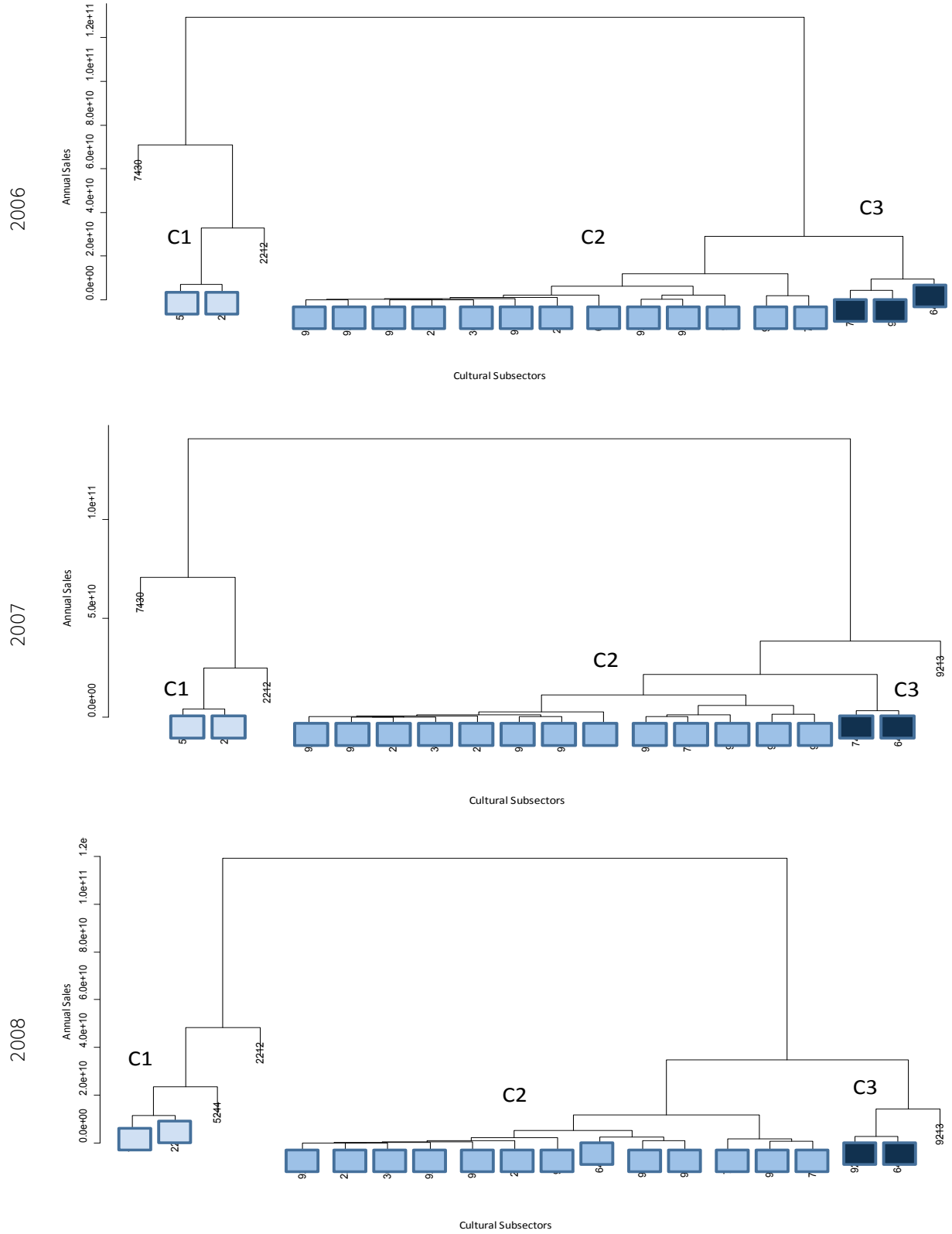
Figure 1: Distribution of sales of cultural subsectors



Source: Own calculations with data from DIAN

Following the methodology described in the previous section, Figure 2 shows the dendrograms applied to the IC for 2006, 2007 and 2008. For purposes of the interpretation of the graphs, it is pertinent to note that the length of the vertical lines of each dendrogram, and the corresponding range in the axis of annual sales, accounts for the differences between the groups to be merged in successive stages of clustering. Precisely for this reason is that it is possible to guess how strong or weak are the similarities between the cultural subsectors in terms of production: the longest vertical lines indicate that the differences between subgroups are larger, while short vertical lines imply that the clusters are relatively less dissimilar.

Figure 2: Dendrograms **of absolute sales of the subsectors of the IC (2006 - 2008)**



Source: Own calculations with data from the DIAN

For 2006, it is possible to identify three groups of subsectors that showed a similarity in production sales volumes recorded at the end of the year (each group represented by C1, C2 and C3). The cluster C1 corresponds to the most active subsectors in relation to sales, with annual amounts near or slightly above the $ 100,000 million pesos. The C2 cluster consists of the IC subsectors that are less active, with sales between $ 100 and $ 18,000 million pesos annually. And finally, the cluster C3 corresponds to those subsectors that are more active than those in C2, but clearly less active than C1 subsectors. The subsectors in the latter group exhibited annual sales close to or slightly higher than the $ 20,000 million pesos.

In terms of composition, the C1 cluster was integrated by two subsectors: *Publishing of books and other publications* and *Retail sales of books, periodicals, materials and stationery and desk.* The C2 cluster was formed, as expected, by the majority of the cultural subsectors: *Publishing of recorded media; Reproduction of recorded media; Games and toys; Transmission services of radio and television programs; Research and experimental development on social sciences and humanities; Production and distribution of films and videotapes; Exhibition of films and videotapes; Dramatic arts, music and other arts activities; Other entertainment activities n.e.c; News agency activities; Library and archives activities; Museums activities and preservation of historical sites and buildings; Activities of botanical and zoological gardens and national parks.* Finally, *Cable transmission services, Photographic activities* and *Radio and television activities* are all part of the C3 cluster. As expected, *Advertising* was not part of any cluster due to the fact that its sales are much higher in comparison with the rest of cultural subsectors.

In 2007 it is also possible to identify the same three groups of cultural subsectors along with the same characteristics associated with sales volume described for C1, C2 and C3 before. However, the composition of each cluster had some little modifications. C1 and C2 continued to be integrated by the same cultural subsectors or what is the same, there are not observable transitions or migrations of subsectors into some other clusters from year to year. However, the third group varied in composition with respect to that one observed for 2006. Specifically, we found that by 2007, the subsector *Radio and television activities* increased its revenues to an amount close to 40,000 million pesos, which is why was no longer part of the cluster C3 to be located outside of identifiable groups. Of course, the reader may surmise that the increase in sales of this particular cultural subsector could be an incidental matter. Unfortunately, for the simplicity of the calculations and the restriction of data for the analysis, this document falls short answering that question. However, taking into account the dendrogram for the next year, 2008, the change in the composition of the group 3 is maintained indeed, so you might think that the increase in sales in the *Radio and television activities* subsector is not necessarily random. Again this year, *Advertising* subsector is excluded from any of the three clusters identified here for the reasons stated above.

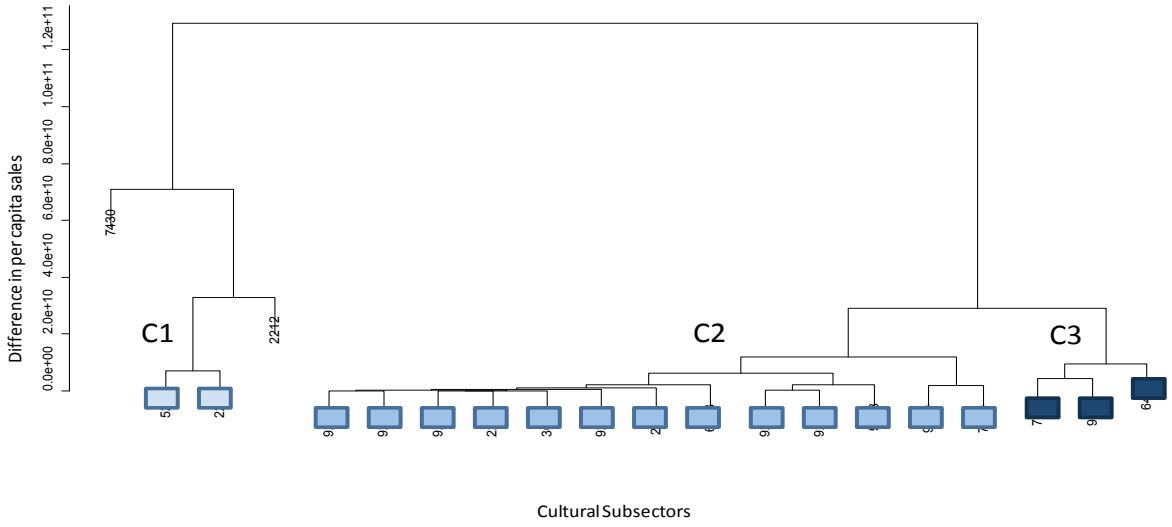
Finally, in 2008 as in the other two years, the three clusters are still clearly distinguishable. Although in general the composition of each cluster is similar to that of the previous two years, for the first group there is an important difference: the *Advertising* subsector previously classified as the more dissimilar compared to the other subsectors due to its outstanding sales, is now part of the C1 cluster with nearly $ 100,000 million pesos of sales. This means that its sales fell compared to the volumes recorded for the previous periods. The C2 cluster also exhibited some change in its composition: there was a transition of the *Other entertainment activities n.e.c* subsector from this second group to the third –a little more dynamic cluster, while *Photographic activities* became part of C2.

In the analysis applied to the average sales per company within each subsector we found, keeping the proportions, the same results observed for the analysis of absolute sales in terms of the grouping dynamics. This is, it is also possible to observe the same clusters of subsectors assessing now the average income generation of a company belonging to one of the IC subsectors (see Figure 3) for the three years considered. In this order, the groups identified by studying the aggregate revenue of all firms are in each case, in accordance with the groups identified by studying the average sales per company: the highest sales/average sales, medium sales/average sales or lower sales/average sales. Therefore, one might guess that sales quotas within each of the three clusters are relatively similar between the numbers of affiliated firms. However, it should be noted that this result does not imply the absence of high levels of intensity in competition or concentration of power in each subsector[4].

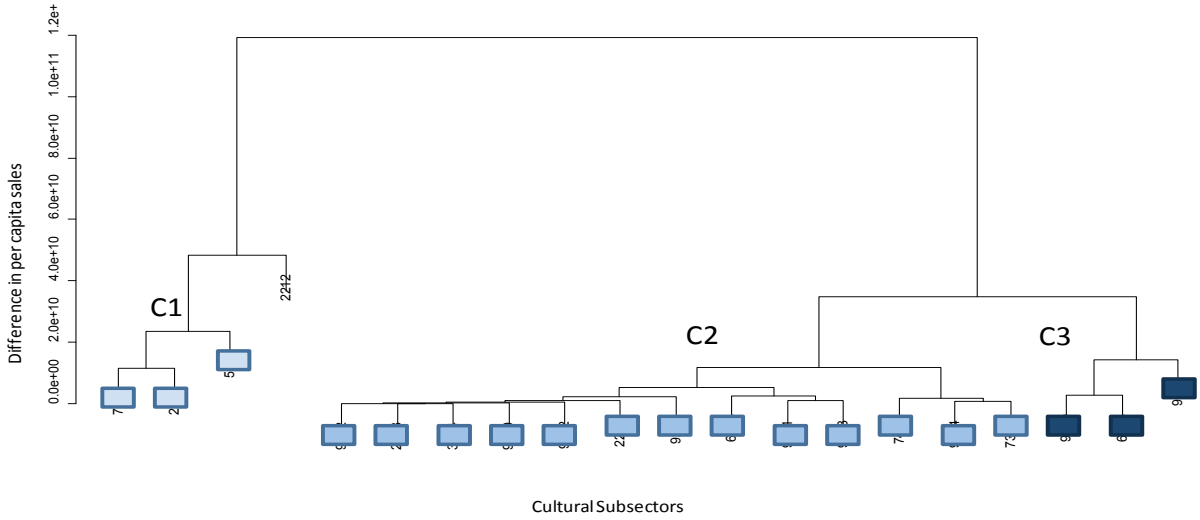
Figure 3: Average annual sales per firm in the subsectors of the IC (2006 - 2008)

4 A market of this type could be composed of two firms that share sales equally, but the two serve the entire market demand. That is still an oligopolistic structure.

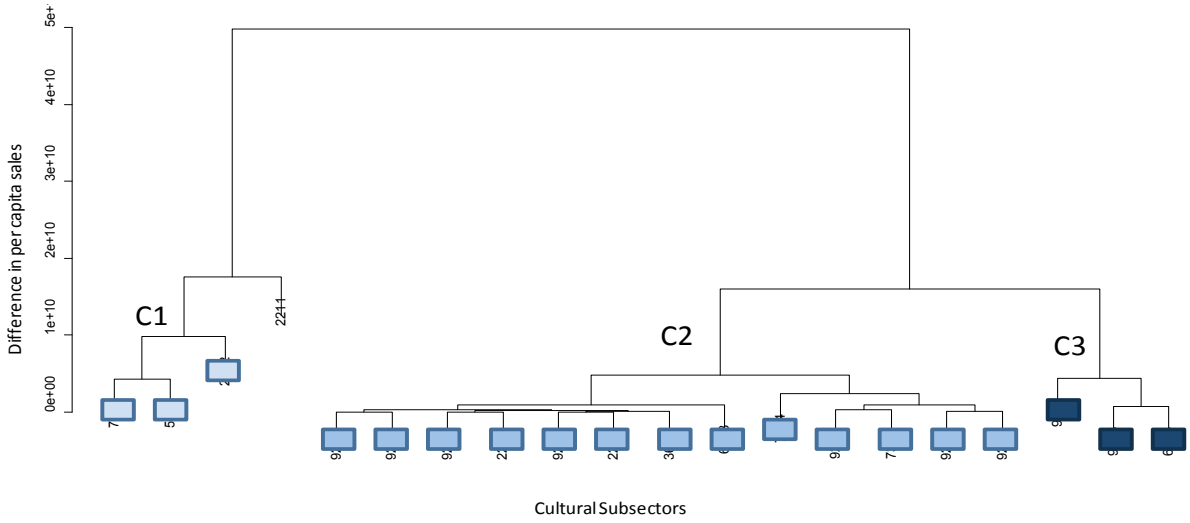
2006



2007



2008



Source: Own calculations with data from the DIAN

There are two important conclusions from this graphical approach: i) there is a clear asymmetry in the production inside the IC, which is evidenced by the strong segmentation between subsectors whose sales are over $ 60,000 million pesos and those below this amount (a good part of the IC), results proportionately replicated in the analysis of average sales per company in each subsector; ii) There is a relative stability in the composition of clusters throughout the years analyzed.

4.2 Clustering by similarity in degree of concentration of power sales

In the analysis of the intensity of competition within the IC by calculating the concentration index, we found that the vast majority of the subsectors are highly concentrated according to the classification established by the FTC with respect to HHI (See Table 3). Among the most concentrated subsectors with indices higher than 0.95 points you can find *Activities of botanical and zoological gardens and national parks* and *Library and archives activities*. Other concentrated subsectors are *Production and distribution of films and videotapes; Publishing of newspapers, journals, etc.; Transmission services of radio and television programs; Publishing of books and other publications.* Among the less concentrated subsector we identified *Photographic activities* and *Advertising*.

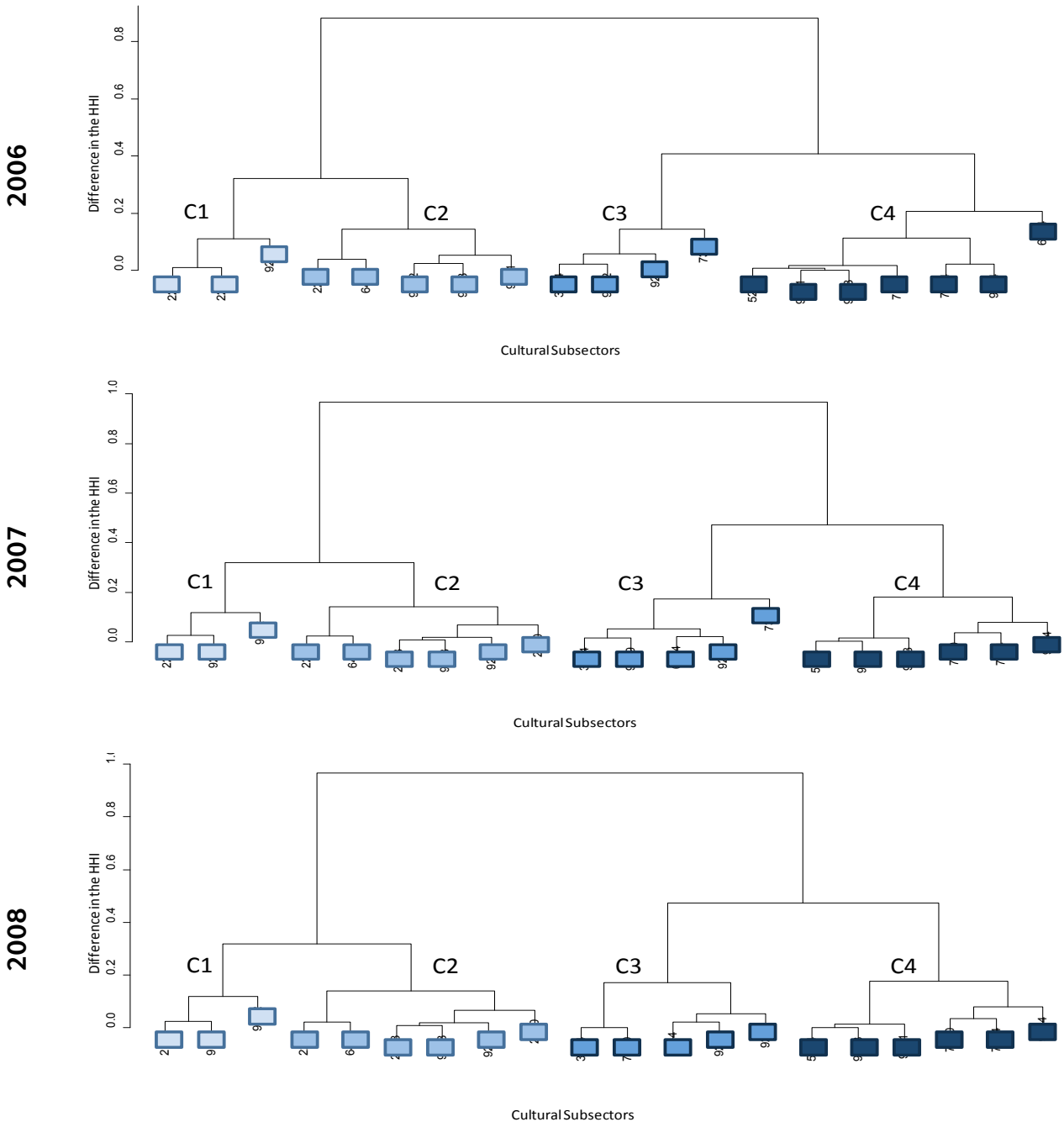
Table 3: Annual HHI for the 20 subsectors of the IC 2006 to 2008 (1 of 2)

ISIC	Economic Activity	2006	2007	2008
2211	Publishing of books and other publications	0.784	0.775	0.775
2212	Publishing of newspapers, journals, etc.	0.887	0.859	0.859
2213	Publishing of recorded media	0.773	1	1
2240	Reproduction of recorded media	0.52	0.468	0.337
3694	Games and toys	0.214	0.214	0.196
5244	Retail sales of books, periodicals, materials and stationery and desk	*	0.933	0.933
6423	Transmission services of radio and television programs	0.849	0.882	0.882
6424	Cable transmission services	0.318	0.485	0.485
7320	Research and experimental development on social sciences and humanities	0.225	0.034	0.034
7430	Advertising	0.134	0.07	0.07
7494	Photographic activities	0.209	0.21	0.21
9211	Production and distribution of films and videotapes	0.969	0.981	0.981
9212	Exhibition of films and videotapes	0.207	0.198	0.198
9213	Radio and television activities	0.112	0.113	0.113
9214	Dramatic arts, music and other arts activities	0.672	0.453	0.453
9219	Other entertainment activities n.e.c	0.461	0.506	0.506
9220	News agency activities	0.94	0.8	0.8
9231	Library and archives activities	0.497	0.681	0.681
9232	Museums activities and preservation of historical sites and buildings	0.993	0.992	0.992
9233	Activities of botanical and zoological gardens and national parks	0.376	0.334	0.335

* Only one company reported sales, which is why this subsector is excluded.
Source: Own calculations with data from the DIAN

Applying the same clustering analysis now with respect to the variable intensity of competition as measured by the HHI, it was found that groups or clusters that had previously been grouped by the similarity in their sales are not necessarily part of the same cluster analyzing concentration levels. The explanation is that the sales themselves do not explain the ability of some companies within each subsector to concentrate revenues associated with its production. From Figure 4 it is possible to identify four clusters composed of the branches that share the same levels of market power. Groups C1, C2 and C3 are similar in the sense that the associated subsectors exhibit near-monopoly market structures (highly concentrated as classified by the FTC). However, group 1 presented a higher intensity of competition compared with group C3, but lower compared with group 2, which means that the subsectors that comprise the cluster C2 are the most concentrated among the IC. The C4 group as expected then collects those subsectors that could be considered not or low concentrated.

Figure 4: Dendrogram **of the intensity of competition within the IC (2006 - 2008)**



Source: Own calculations with data from the DIAN

In terms of composition of each cluster by 2006, the first group of these (C1) was formed by the subsectors *Publishing of books and other publications*, *Publishing of recorded media*, and *Other* entertainment *activities n.e.c.* In the second cluster (C2) were grouped *Publishing of newspapers, journals, etc.; Reproduction of recorded media; Transmission services of radio and television programs; Exhibition of films and videotapes; Library and archives activities and Activities of botanical and zoological gardens and national parks.* The third cluster (C3) was formed by *Games and toys; Research and experimental development on social sciences and humanities; News agency activities and Museums activities* and *preservation of historical sites and buildings.* The last cluster (C4) was composed of the subsectors *Retail sales of books, periodicals, materials and stationery and desk; Cable transmission services; Advertising; Photographic activities; Production and distribution of films and videotapes; Radio and television activities; and Dramatic arts, music and other arts activities.*

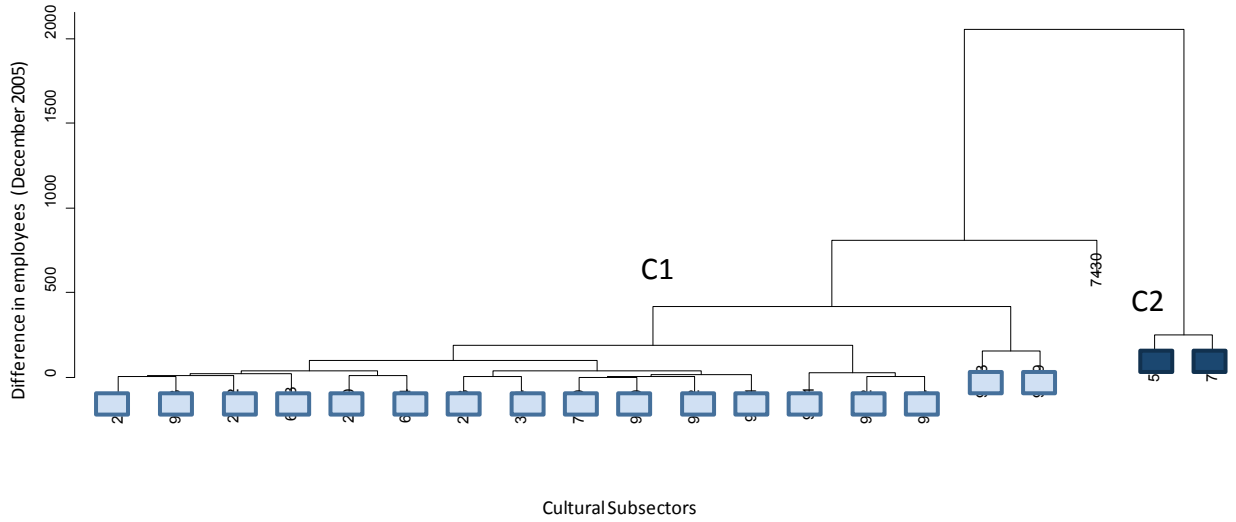
For 2007, the composition of the four clusters remained slightly similar to that observed in 2006, although some transitions were observed in some subsectors that increased their respective concentration levels. This was the case of *Publishing of recorded media* that moved from the cluster C1 to integrate the cluster C2. However, it is noteworthy that there were no strong transitions of the subsectors that recorded the highest levels of concentration to the clusters less concentrated, nor otherwise. Exactly the same behavior was observed for 2008 (see Figure 4).

This second graphical analysis supports the two conclusions that were reached with the sales approach: first, the obvious asymmetry in the production inside the IC is justified by the fact that most subsectors were classified in clusters where the similar feature is significant concentration levels. Second, transitions from one cluster to another are not common when the characteristics of each group are very different, which means that the behavior of IC is relatively stable.

4.3. Clustering by similarity in the number of employees by sub-cultural

The final clustering analysis we conducted was with respect to the average number of employees hired by each cultural subsector, based on information provided by the CECY 2005. As a result, we found it possible to identify two subgroups or clusters with similar characteristics on this variable, and a dissimilar subsector that is not part of any cluster (see Figure 5).

Figure 5: Average number of employees by subsector of the IC (2005)



Source: Own calculations with data from the DIAN

The C1 cluster in the figure corresponded to those subsectors that hired on average up to 49 employees per firm, i.e., a cluster formed by micro and small enterprises that employed in 2005 up to 426 individuals per subsector. This cluster was comprised of 17 of the 20 cultural subsectors: *Publishing of books and other publications; Publishing of newspapers, journals, etc.; Publishing of recorded media; Reproduction of recorded media; Games and toys; Transmission services of radio and television programs; Cable transmission services; Research and experimental development on social sciences and humanities; Production and distribution of films and videotapes; Exhibition of films and videotapes; Radio and television activities; Dramatic arts, music and other arts activities; Other entertainment activities n.e.c; News agency activities; Library and archives activities; Museums activities and preservation of historical sites and buildings; Activities of botanical and zoological gardens and national parks.*

The C2 cluster was composed of the subsectors: i) *Retail sale of books, periodicals, materials and stationery and desk* and ii) *Photographic activities*. This cluster is comprised of two sectors with very low average number of employees per firm: 4 and 7. In other words, it is a cluster consisting entirely of small firms. But unlike the first cluster, these two sectors demand more jobs in aggregate terms: the subsector *Retailing books, periodicals, materials and stationery and desk, in specialized stores* employed 2061 individuals, while the subsector *Photographic activities* employed 1810 in 2005. Therefore, this last cluster is composed of cultural subsectors

that generate more employment compared with the rest of the IC, but at the same time comprised mainly by small businesses. The first cluster, unlike the latter, is composed of subsectors with companies on average slightly larger that generate fewer jobs in total.

5. CONCLUSION

One of the most important economic development policies of the administration of Santiago de Cali has been the revitalization of the Cultural Industries (IC). However, at the municipal level there is little information. This document is an effort to provide relevant information for entrepreneurs when deciding whether or not to enter this sector of the economy.

As results of the analysis we found that there is a strong asymmetry in the distribution of sales quotas within most cultural activities and a clear division of clusters in terms of four variables: total sales by cultural subsector, average sales per company per cultural subsector, intensity of competition and number of employees. In terms of transition in the sales or concentration analysis, it was found that the active migration from one cluster to another when the characteristics of each group are very different is not common, which means that the behavior of the IC is relatively stable, regardless of the variables we consider. On the side of job creation it was possible to identified two clusters: the first one is characterized as consisting exclusively of micro enterprises that in total generated a higher amount of jobs. The second cluster is composed of subsectors with relatively larger enterprises, mostly micro and small enterprises, that in total generated fewer jobs than the subsectors in the first cluster.

The information presented here is useful to understand the microeconomic behavior of the Cultural Industries, which altogether with macroeconomic indicators such as satellite accounts of culture, provide a good frame to understand the performance of this sector in the city of Cali. But such information could be especially useful to investors as it allows them to determine or limit the investment opportunities within this industry. This analysis identifies the sectors with higher turnovers, those with lower levels of competition and those that require less investment in payroll costs, three features of particular importance from a practical point of view of barriers to entry. This is the case of cultural subsectors such as *Advertising* and *Retail trade of books, periodicals, materials and stationery and desk*, subsectors that belong simultaneously to clusters of higher sales without excessively high payroll costs, but also to those with less intense competition.

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