Are concentrated companies more profitable?
The case of the tanning sector of skins in Ecuador

¡Son rentables las empresas concentradas?
El caso del sector de curtido de pieles en el Ecuador

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Abstract

The present research identifies the market structure of the Tanning and Leather Sector in Ecuador ISIC: C151101and aims to establish the relation between profitability, costs and market concentration. The Herfindhal-Hirshman index used for cases of imperfect market structure has been calculated; and on the other hand, the solvency, liquidity and profitability to evaluate the financial performance of the concentrated companies. Additionally, four econometric models have been designed to which statistical tests of adecuacy have been applied. Simple and multiple linear regression analysis has been applied in several experiments through Ordinary Least Squares. Of the nine oligopoly companies, four companies have been identified that control 73,12% of the market, with a margin of return of 0,1391 average of the oligopoly for the period of study 2011-2015. One of the developed econometric models has made possible to show through Fisher's statistical test that market concentration and production costs have an effect on profitability with a p-value of 0.00035, meaning that there is a significant linear relation of the oligopoly with cost production and market concentration, demonstrating that this group of companies makes profits because of their ability to concentrate the market.

Resumen

El presente trabajo de investigación identifica la estructura de mercado del sector Curtido y Adobo de Pieles en el Ecuador CIIU: C151101 y tiene como objetivo establecer la relación entre rentabilidad, costos y concentración de mercado. Se calculó el índice de Herfindhal-Hirshman utilizado para casos de estructura de mercado imperfecta; y por otro lado, los índices de solvencia, liquidez, rentabilidad, para evaluar el desempeño financiero de las empresas concentradas. Además, se diseñaron cuatro modelos econométricos a los cuales se aplicaron pruebas estadísticas de idoneidad de los estimadores. Se aplicó análisis de regresión lineal simple y múltiple en varias experimentaciones a través de Mínimos cuadrados Ordinarios. De las nueve empresas del oligopolio, se identificaron cuatro empresas concentradas que controlan el 73,12% del mercado, con un margen de rentabilidad del 0,1391 promedio del oligopolio para el período de estudio 2011-2015. De los modelos econométricos desarrollados uno permitió evidenciar a través de la prueba estadística de Fisher que la concentración de mercado y los costos de producción inciden en la rentabilidad con un p-value de 0,00035, es decir, existe una relación lineal significativa de la rentabilidad del oligopolio con los costos de producción y la concentración del mercado, demostrándose así que este grupo de empresas obtienen beneficios por efecto de su capacidad para concentrar el mercado.

1. Introduction and state of the issue

In Ecuador, there are several sectors of economic activity which remain in constant business activity, this means the same behavior in consumers, producers and intermediaries and, finally, in the State. As the sectors where supply and demand emerge consecutively, the presence of competitive tactics that benefit both consumers and producers is evident; which results in the existence of high concentration levels of some companies in each sector. This business behavior depends on several aspects, which start from the type of sector, its importance within the national economy, the degree of social involvement that companies have as a response to their degree of social responsibility. According to INEC figures for 2015, one of the most representative sectors is wholesale and retail trade, represented by 46.75%, followed by the Manufacturing Industries sector with a participation of 16.39%. Due to the above, an economic sector that contributes greatly to employment in Ecuador is the wholesale and retail trade, contributing 26.15% to employment sources nationwide, followed by the manufacturing sector that reports 19.50%, including the business activity of Tanning and Dressing of hides in Ecuador (Lema, 2017).

This sector was developed 70 years ago in Ecuador, in an artisanal manner and as the years passed. It began to be industrialized as a result of the urban projection that grew in the last decades; as of 2013 and 2014, the sales of the tanned and dressed leather sector had a significant growth in relation to 2011, where there was a growth of 24.82% and 17.86%, and then in the subsequent years 2015 and 2016 denote a decrease in the sector (Lema, 2017). It is necessary to differentiate that within the Leather Manufacturing Sector in Ecuador there are two subsectors of economic activity; the first of tanning and dressing of leather, manufacture of suitcases, handbags, saddlery and the last shoe manufacturing, being this the most representative in sales at national level contributing with 86.74% of the sector according to figures for the year 2015. As said above, the first subsector represents 10.09%. In fact, although the leather tanning and dressing sector is not very representative in terms of productivity or contribution to employment, it is nevertheless necessary to know the degree of impact on the consumer in the event that the sector is concentrated (Lema, 2017).

In this context, the objective of this paper is to determine whether the concentration levels have a response effect on the profitability levels of the companies, if this is the case, the dominant companies would maintain a state of conformity which in the long term limits, notably, innovation as a consequence of the incipient business interaction, fostering business wealth and generating a setback in terms of equity and economic growth of the sector. All this is identified through the financial indicators applied to companies. In the same way the financial performance of the Colombian companies in the leather goods and leather sector is analyzed in the investigation of Cardona Olaya, Martínez Carvajal, Velásquez Restrepo, & López Fernández (2015), the present study carries with it a descriptive application of the documentary information, which deals with fourteen indicators of profitability, leverage, asset management, value generation, and liquidity by economic activity by year. With respect to the acid test indicator, this considers the accounts of the current assets except the inventory to divide it with the current liabilities, as it is a more effective measure when the inventory does not have an immediate capacity to become cash. In this study differences in the financial performance of the four economic activities that make up the sector were

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detected. The research by Castaño Ríos et al. (2016) applies financial performance indicators (ROE-ROI) to the cement, lime and gypsum companies of the department of Antioquia and their contribution to manufacturing GDP during the periods 2008-2013. Using a quantitative-descriptive analysis, a direct relationship between the three variables (ROE-ROI and GDP) was found, which allows to investigate whether the most profitable companies contribute to GDP. The use of financial variables in the application of correlation studies is broad and allows to evaluate financially sectors in various economic activities where large, small and medium-sized companies arise and where the power of management is a factor of success for the companies; the immediate effect is represented in sales, which leads to companies with a high market share, which subsequently contributes subject to qualifying them as concentrated markets.

The presence of concentrated markets is an event present all over the world, which means a constant struggle between control entities and companies whose market conditions promise to be the most favorable for large business groups and the most harmful to citizens in general. Thus, the conditions of concentration differ according to the reality and the laws of each country. However, the same objective is sought, to try to protect the most vulnerable sectors of the population to suffer the negative effects of the exercise of market power that, in some cases, are harmful and disloyal. The studies that will be detailed below structure an inferential and descriptive analysis addressing concentrated sectors of the economy at a global and regional level, to which an econometric methodology is applied that allows to identify the effects and causes that lead to the concentration of the market.

A market that has a limited number of active companies is known as imperfect competition, which is presented as a monopoly, oligopoly or monopsony. Oligopoly is one of the most common imperfect competition market forms and Jaén et al. (2013) characterize it as an intermediate situation between perfect competition and monopoly in which market power is not necessarily exercised. This is because the demand of a company is related to that of the competition; that is, it is not as independent of its environment as the demand for a monopoly. In this way, in an environment of perfect competition, companies can apply control strategies, an aspect that properly arises from the structure of their market.

Companies apply strategies to acquire control over the sector in which they operate, which can be based on the price or not. Within price-based strategies, as Jaén (2013) states, price discrimination is found in the first, second and third grades, while non-price-based strategies can be classified as batch sales, joint or basket of goods and linked sales. The privilege of having few competitors in the market allows the adoption of certain domain strategies; however, this privilege is limited by several factors. A prime case is that of the presence of entry barriers, the understanding of which is inherent to the exercise of market power, and the conception of oligopoly or monopoly would be empty without considering this factor.

The introduction of barriers to entry by the owners can be based on the extensive knowledge that companies have of suppliers and, sometimes, of certain advantages that these companies can offer them. This does not necessarily mean an illegal action. Nevertheless, it is a strategy of implantation of barriers to the entrance of possible competitors.

On the other hand, the oligopolistic market structure determines that there are several factors that competitors handle as a market penetration strategy that directly influence the consumer and formalize their market share. Historically, the structure of the market in the sector has been concentrated, with multinational companies that have always controlled the market and, being banana production and marketing one of the most important economic sectors on the Colombian Caribbean coast, it is very important to describe the behavior of the companies and consumers that control the market. For that purpose, we use the Herfindahl-Hirschman index, together with a model of the behavior of the strategies carried out by the marketers following game theory and a multiple linear regression model of the price to the producer according to the level of concentration of the sector and the cyclical behavior of banana prices. Following this, the social effects of market concentration are monitored, so that it can be determined if the existing market structure generates positive or negative effects on the population. It showed that the market for banana trade is concentrated and that there is an inverse relationship between producer prices and market concentration expressed through the Herfindahl-Hirschman concentration index. The social losses generated by the concentration and market power exercised by the banana traders are considerable.

Continuing with the possibility of exercising market power through the formation of prices, in the context of the world production of palm oil *et al.* (2013) seek to study the market structure of the world production of palm oil and the analysis of the influence of this variable on the price level of the product, a causal characteristics study is made by means of a correlation analysis between the levels of market concentration of the sector and the prices of palm oil established within its market. In order to carry out this study, a correlation statistical analysis is carried out together with the description of the Herfindahl-Hirschman Index (IHH), the Domination index (ID), the concentration rate (CR) and the palm oil price in the international market. A considerable relationship was found between the international prices of the product and the degree of market concentration. However, the presence of abuse of market power was not observed, which assumes that a concentrated structure does not necessarily imply exercising power over it as a monopoly or oligopoly. This is due to the ease of entering the sector, which led to a change in the leadership of the market, since it went from being dominated by a single producer to being led by two producers.

2. Materials and methods

For the realization of this research work, first, we proceeded to identify the sector and companies that develop tannery activities. This activity is identified by the Internal Revenue Service (SRI) under the ISIC code: C142001 according to the National Classification of Economic Activities according to the National Institute of Statistics and Censuses (2012), however, according to the database of the Superintendency of Companies of Ecuador, the companies that carry out tannery activities are identified under the ISIC code: C151101, due to this, the companies were identified according to the criteria of the Superintendence of Companies. and for its contrast with the total sales of the sector, the criterion of the SRI was considered, and it was approved based on the description of both. The companies that develop activities and are active in the sector to the year 2017, are Curtiduría Tungurahua S.A., Curtiembre Renaciente S.A.,

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Servicueros S.A., Tenería San José Cía. Ltda., Tenería Díaz Cía Ltda., Cabaro Cia. Ltda., Curtigual S.A., Promepell S.A. and Proinpiel S.A.

For the analysis of the total sales of the sector, the study was based on the statistics provided by the SRI derived from the declaration form to the Value Added Tax (VAT) of companies and individuals, since it provides information regarding sales taxed with VAT, which represent the totality of commercial transactions that companies carry out in Ecuador.

For the descriptive analysis we used the data of Income, Sales, Production Costs, Fixed Assets and Long-term Liabilities during the period 2011-2015 of the four companies with the highest sales volume in the sector (Curtiduría Tungurahua, Servicueros, SA, Curtiembre Renaciente SA and Tenería San José Cía. Ltda.). In addition, solvency, liquidity and profitability indicators are presented, for which the equity account was adopted as an indicator of solvency, current liquidity as an indicator of liquidity and the gross margin of profitability as an index of profitability. The use of the financial ratios that includes the methods of calculation and interpretation, allow the financial manager to conduct the analysis of the performance, solvency and liquidity of the companies in the continuous exercise of the manufacturing activity in any sector. On the other hand, it is necessary to consider that the correct management of cash management allows to determine if the analyzed companies have sufficient short-term available resources to comply with their obligations. The short-term creditors of the company believe that the higher the ratio of the currency is much better for creditors as suppliers because it can show a high liquidity. Likewise, solvency ratios involve measuring the capacity of companies to satisfy their long-term obligations. For the preparation of these financial indicators, it was necessary to identify the accounts of the current Assets and Liabilities, the total Assets and Liabilities and the estate account, so that the aforementioned relationships can be carried out; Chart 1 shows a summary of the indicators to be analyzed and their corresponding calculation.

Chart 1. Indicators

Índice	Fórmula
Endeudamiento patrimonial	$= \dfrac{Pasivo\ no\ corriente}{Patrimonio}$ (1)
Liquidez corriente	$= \dfrac{Activo\ corriente}{Pasivo\ corriente}$ (2)
Margen bruto	$= \dfrac{Ventas - Costo\ de\ ventas}{Ventas}$ (3)
Índice de Hirschman-Herfindahl	$= \sum \left(Cuota\ de\ mercado\right)^{2} \times 10.000$

Source: Tanaka (2005); Caballero (2014), Aching (2006), Parkin & Loría (2010).

The main research hypothesis is that market concentration is related to the performance of companies in the tanned leather manufacturing sector in Ecuador. Consequently,

the aim is to identify the degree of market concentration that the sector presents and to contrast the fact that the Herfindahl-Hirschman concentration index statistically affects the profitability of the companies and vice versa. This will allow knowing if there is concentration in the market and if the companies exercise power over it in order to explain the behavior adopted by the companies engaged in the competitive context.

With respect to the econometric analysis, two simple linear regression models and three multiple linear regression models were structured, from which four interaction variables will be identified: the profitability that is expressed through the gross margin of profitability, the market concentration represented by the Herfindahl-Hirschman concentration index, economic growth as a variation rate of GDP and production costs of the four most representative companies in the sector.

The first model was structured by profitability (Gross margin) based on market concentration (Herfindahl-Hirschman index) as established by Duarte (2014) when presenting a simple linear regression model representing profitability or gross profit as dependent variable and prices per unit produced as an independent variable. In this case, unlike that established by Duarte (2014) in the first model, the market concentration is taken as an independent variable, with the objective of determining the incidence and degree of explanation of the profitability of the four most representative companies of the sector, depending on its degree of concentration, which basically seeks the same objective as Duarte (2014).

$$Y = \beta_0 + \beta_1 X_1 + u \quad (4)$$

Where:

$Y = $ Rentabilidad (Margen bruto).

$X_1 = $ Concentración de mercado (Índice de Herfindahl − Hirschman).

$u = $ Error de perturbación.

β_0 y $\beta_1 = $ Estimadores.

The second model explains the market concentration, that is, the Herfindahl-Hirschman index in terms of profitability or gross margin, in other words, model number 2 is the inverse version of the previous linear regression model. This with the objective of analyzing the degree of explanation of market concentration based on the profitability that leading companies in the sector can obtain.

$$X_1 = \beta_0 + \beta_1 Y + u \quad (5)$$

Where:

$X_1 = $ Concentración de mercado (Índice de Herfindahl − Hirschman).

$Y = $ Rentabilidad (Margen bruto).

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u = Error de perturbación.

β_0 y β_1 = Estimadores.

Model number 3 was designed by the rates of variation of the gross margin of profitability based on the variation rate of the Herfidahl-Hirschman Concentration Index and the economic growth expressed through the growth rate of the GDP of Ecuador. This multiple linear regression model aims to analyze the incidence and degree of explanation of the profitability margins of the main companies in the leather tanning and dressing sector in Ecuador, based on the concentration of the market and the behavior of the economy in its context. It should be noted that the Duarte (2014) criterion of establishing profitability as a dependent variable is again adopted, except that the interaction of the GDP growth rate was incorporated for this model.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u \quad (6)$$

Where:

Y = Tasa de variación de la rentabilidad (Margen bruto).

X_1 = Tasa de variación del índice de Herfindahl − Hirschman.

X_2 = Tasa de crecimiento del PIB.

u = Error de perturbación.

β_0 y β_1 = Estimadores.

Model number 4 was structured with the gross profit margin as the dependent variable and the Herfidahl-Hirschman index, the variation rate of GDP and production costs as independent variables. In this model, it was incorporated into the variable of production costs adopting the criterion of Duarte (2014) that does not necessarily treat this variable as part of an econometric model but take it into account for its descriptive analysis. It was decided to integrate this variable within the model, in order to better identify the effects of concentration and economic growth on the levels of profitability within the sector studied since the gross margin of profitability depends directly on costs of production.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta X_3 + u \quad (7)$$

Where:

Y = Rentabilidad (Margen bruto).

X_1 = Concentración de mercado (Índice de Herfindahl − Hirschman).

X_2 = Tasa de crecimiento del PIB.

X_3 = Costos de producción.

u = Error de perturbación.

$\beta_0, \beta_1, \beta_2$ y β_3 = Estimadores.

Model number 5 results directly from model number 4, since the collinearity test was applied through the Variation Inflation Factor (VIF), which identified that the variable GDP growth rate presented collinearity. Therefore, this variable was dismissed for the development of the econometric model.

$$Y = \beta_0 + \beta_1 X_1 + \beta_3 X_3 + u \quad (8)$$

Where:

Y = Rentabilidad (Margen bruto).

X_1 = Concentración de mercado (Índice de Herfindahl − Hirschman).

X_3 = Costos de producción.

u = Error de perturbación.

β_0, β_1 y β_3 = Estimadores.

Statistical tests were applied to each of the models to determine the suitability of the estimators for the prediction and hypothesis testing through the proposed models such as: the non-linearity test, the Ramsey RESET specification test, of White Heteroscedasticity, the Durbin Watson and Breusch-Godfrey Autocorrelation test, the Collinearity of the Variable Inflation Factor test (VIF) and the normality of the Jarque-Bera residuals. Due to the size of the sample and the number of returnees, it was not possible to perform certain statistical tests on some of the proposed models, such as the Durbin Watson and Breusch-Godfrey autocorrelation test, Ramsey RESET test and the White Heteroscedasticity test.

3. Analysis and results

In the present investigation, an analysis of the market structure of the CIIU: 111501 tanned and dressed leather sector in Ecuador is sought. The sales of each of the companies, the market share and their respective concentration index are described, with which the behavior of the leading companies in the sector can be observed.

Chart 2. Sales of the four concentrated companies in the leather tanning and dressing sector

| Business | Sales | | | | | |
	2011	2012	2013	2014	2015	Average
A	7 157 900,52	9 400 968,82	12 468 131,30	13 827 271,30	12 433 762,50	11 057 606,89
B	2 926 582,98	3 159 810,39	3 681 256,50	5 271 600,06	5 555 130,41	4 118 876,07
C	1 898 848,00	3 116 853,76	4 205 653,05	3 245 023,03	2 658 223,37	3 024 920,24
D	2 870 574,70	2 826 163,04	4 205 653,05	3 948 487,60	2 653 702,29	3 300 916,14
Total:	14 853 906,20	18 503 796,01	24 560 693,90	26 292 381,99	23 300 818,57	21 502 319,33

Source: Own elaboration based on the data provided by the Superintendence of Companies and SRI.

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Sales per company of the oligopoly on average represent 73.42% of total sales made by the entire sector from 2011 to 2015, placing company A, as the company with the highest sales in the market reaching an average of sales of 11 057 606.89 during the period analyzed. Second, there is company B with average sales of 4 118 876.07, while in third and fourth place are D and C with average sales of 3 300 916.14 and 3 024 920.24 respectively.

Chart 3. Sales, Market Share and Sector Concentration Index

Business	Sales 2015	Market share 2015	Hirschman-Herfindahl Index 2015
A	12 433 762,50	39,02%	1522,27
B	5 555 130,41	17,43%	303,86
C	2 658 223,37	8,34%	69,58
D	2. 653 702,29	8,33%	69,34
E	1 718 142,73	5,39%	29,07
F	875 208,52	2,75%	7,54
G	366 862,50	1,15%	1,33
H	280 767,04	0,88%	0,78
I	124 085,87	0,39%	0,15
Other businesses	5 202 307,02	16,32%	266,49

Source: Own elaboration based on data provided by the Superintendency of Companies of Ecuador

As can be seen in Chart 3, the company that leads the market represents 39.02% of the sales of the leather tanning and dressing sector. The second place, representing 17.43% of total sales in the market, followed by 8.34% and 8.33% in the third and fourth place market share respectively. In the sector there are 11 active companies registered as companies (2 of which do not record sales in their financial statements during 2015), while the companies established as natural persons represent 16.32%.

Chart 4. Solvency by company

Solvency-Indebtedness						
Business	2011	2012	2013	2014	2015	Average
A	2,76	2,33	2,47	2,52	1,57	2,33
B	1,63	1,61	0,85	1,09	1,65	1,37
C	1,11	2,1	2,38	2,49	3,25	2,27
D	3,64	1,74	2,38	1,48	1,6	2,17

Source: Own elaboration based on data provided by the Superintendency of Companies of Ecuador

The most solvent company of the oligopoly is undoubtedly the company B that on average on the analyzed period registered a patrimonial indebtedness of 1.37, which, although it is not an optimal solvency value, is the lowest observed in the whole oligopoly. The second most solvent company is D, which, although it presented a high level of equity indebtedness during 2011, experienced a marked decrease during subsequent years. On the other hand, companies A and C have the highest average insolvency rates of the period, which shows a high level of financing potentially used to expand in the market, since these two companies have the highest installed capacity of the entire oligopoly.

Chart 5. Current liquidity by company

Liquidity-Current liquidity						
Business	2011	2012	2013	2014	2015	Average
A	1,52	1,91	1,2	1,22	1,67	1,504
B	2,07	2,35	1,9	1,91	2,58	2,162
C	1,93	1,18	1,63	1,17	1,18	1,418
D	1,25	0,99	1,63	1,33	2,14	1,468

Source: Own elaboration based on data provided by the Superintendency of Companies of Ecuador

The company with the highest liquidity in the sector is company B, since on average it recorded a current liquidity value of 2.16 during the analyzed period, which is above the optimum limit. During the years 2013 and 2014, company B presented a reduction in its liquidity margins, which is attributable to the expansion strategy. Finally, there are the companies C and D which presented, on average, during the whole analyzed period the lowest current liquidity indexes, these being 1.42 and 1.47 respectively, while company A remained within the optimal limits of liquidity.

Chart 6. Profitability, gross margin by company

Profitability-Gross margin						
Business	2011	2012	2013	2014	2015	Average
A	0,09	0,16	0,17	0,12	0,14	0,14
B	0,17	0,18	0,16	0,13	0,1	0,15
C	0,31	0,31	0,28	0,33	0,27	0,30
D	0,17	0,13	0,27	0,15	0,06	0,16

Source: Own elaboration based on data provided by the Superintendency of Companies of Ecuador

The most profitable company of the oligopoly is company C, registering a value of the average gross profit margin of the period of 0.30. The margins of profitability of the company maintained a stable behavior without clear ascending or decreasing trends, except for the year 2014, in which the highest level of profitability of the company was recorded, this being 0.33. On the other hand, the company with the lowest gross margin of profitability is company A, recording an average gross margin of 0.14

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throughout the period analyzed. The company maintained a decreasing trend in its profitability, especially since 2013, which resulted in a significant decline in profitability for 2014 and a slight recovery for 2015.

Chart 7. Sales, production costs, profitability and market concentration of the companies concentrated in the sector

Years	Sales of concentrated companies	Production costs of the concentrated companies	Profitability (Gross margin) of the concentrated companies	Market concentration
2011	14 853 906,20	13 246 396,87	0,1082	1 423,10
2012	12 560 779,21	10 451 712,84	0,1679	1 893,34
2013	16 149 387,80	13 461 679,91	0,1664	2 186,64
2014	19 098 871,36	16 725 817,56	0,1243	2 061,77
2015	17 988 892,91	15 673 051,95	0,1287	2 010,68

Source: Superintendence of Companies

Chart 8. Sales variation rates, production costs, profitability and market concentration of the sector

Indicators	Sales Variation rate of the main companies	Production costs Variation rate of the main companies	Profitability Variation rate of the main companies (Gross margin)	Market concentration Variation rate
2012	-15,44%	-21,10%	55,15%	33,04%
2013	28,57%	28,80%	-0,88%	15,49%
2014	18,26%	24,25%	-25,34%	-5,71%
2015	-5,81%	-6,29%	3,61%	-2,48%

Source: Own elaboration based on data provided by the Superintendency of Companies of Ecuador

The production costs of the oligopoly presented in Table No. 5 show a harmonious behavior with sales that is not the result of a variation in prices. For 2014, there was a significant reduction in the gross margin of profitability and a slight recovery experienced during 2015, which could be attributed to the slowdown in the Ecuadorian economy in the three previous years.

The market concentration expressed through the Herfindahl-Hirschman index experienced a marked growth during the years 2011, 2012 and 2013, that is to say that the oligopoly studied maintained an expansive process of market capture resulting in an increase in the participation quota in the sector, so that later during the years 2014 and 2015 the concentration of the oligopoly would decrease. During the course of the year 2011 to the year 2013, the Herfindahl-Hirschman concentration index grew by an

average of 18.83%, while from 2013 to 2015 the indicator decreased by an average of 4.11%, which is appreciable the expansion of the oligopoly with respect to the year 2011.

Next, we present the econometric model that explains the profitability of the oligopoly with the variables concentration and production costs. The chosen model is the result of 4 experimentations, based on the models included in the methodology section. The variable GDP growth rate was rejected due to the fact that it presented collinearity registering a value higher than 10 through the Variable Inflation Factor test (VIF), this being 14,943.

Chart 9. Profitability based on market concentration and production costs

Variable	Coefficient	Standard error	Statistic t	Probability value
Constant	1,1964E-01	8,6279E-03	13,87	0,0052
Market concentration (IHH)	7,7137E-05	4,0101E-06	19,24	0,0027
Production costs	-9,22E-09	4,85808E-10	-18,98	0,0028
Corrected determination coefficient:	0,9929			
Fisher statistic:	280,65	p Value:	0,0036	
Non-linearity test				
Null hypothesis: The relationship is linear	Valor p:	0,0821		
Normality test of the waste of Jarque Bera				
Null hypothesis: the error is normally distributed	P Value:	0,7832		

Source: Own elaboration based on the statistical data described in Table 7

As can be seen in Chart 7, the market concentration affects the profitability of the oligopoly, since a p-statistically significant value with a value of 0.0027 was evidenced. Likewise, it was determined that the production costs also affect the profitability of the oligopoly, since it observed a p-value of the statistically significant estimator, of 0.0028. In addition, a coefficient of determination of 0.9929 was registered, which implies that market concentration and production costs explain 99.29% of the profitability of the oligopoly.

Through the non-linearity test, it was determined that the variables of the model are linearly related, since a p-value of the non-significant statistic with a value of 0.081 was observed. Likewise, it was evident that the residuals of the model are normally distributed, since a value of the Jarque-Bera statistic of 0.7832 was observed, which determines that the estimators are reliable, biased and efficient.

4. Discussion and conclusions

The presence of market concentration is usually related to the power to impose prices above what would be fair at the expense of consumer welfare; however, this may not always happen. An evident case of the presence of concentration and the exercise of

Morales Carrasco, Lilian V., Córdova Pacheco, Ana C., Altamirano Espíndola, Luciano D. & Lema Tituaña, Eva C. (2018). Are concentrated companies more profitable? The case of the tanning sector of skins in Ecuador?. *Retos, 15*(I), 143-156.

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market power is evidenced by Duarte (2014), by recording a relationship between profitability and concentration level. In contrast, Navarro, Ocampo & Saumeth (2013) also recorded incidence of market concentration on profitability within the palm oil manufacturing sector; however, the research ruled out any possibility of exercising market power due to the lack of barriers to entry. The present study shows similar findings to what was observed by Duarte (2014) when a relation between the profitability and the concentration index of Herfindahl-Hirschman is evidenced and the presence of exercising market power is considered.

Business performance is linked to the cyclicity of the economy as a whole. However, the sectors of economic activity that maintain barriers to entry are reluctant to be affected by recessive processes. The research observed the inexistence of a relationship between the growth rate of GDP and the profitability of tanneries. This independence between variables is related to the existence of entry barriers, because a sector of difficult access tends to better resist the decrease of productive activity. Castaño et al. (2016), on the other hand, evidenced a strong relationship between the profitability of the cement companies and the GDP of the department of Antioquia; that is to say, a cyclical behavior of the sector was evidenced. In general, the cement manufacturing market has important competitors in the international market, which implies the presence of weak entry barriers.

Four companies were identified as having the highest market share in the leather tanning and dressing sector in Ecuador. The concentrated companies studied in the present investigation control 73.12% of the market share, presenting a Herfindahl-Hirschman index of 2,010.68 for the year 2015.

During the studied period, the four companies with the highest market concentration in the leather tanning and dressing sector on average registered a gross profit margin of 0.1391, that is, for every dollar sold there is a 14% return. These four companies evidenced an increase in their profitability levels in the same period, except for the year 2014.

The market concentration expressed through the Herfindahl-Hirschman Index registered a statistically significant p-value of 0.0027 in conjunction with the variable production costs. The econometric model shows that the part of profitability that is not explained by production costs is importantly explained by the levels of market concentration. That is to say, this group of companies obtain benefits due to their ability to concentrate the market. We accept the hypothesis that the imperfect market structure affects the profitability levels of the leading companies in the leather tanning and dressing sector and that the production costs affect the profitability levels of the oligopoly.

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