

INFLUENCE OF AIRLINES' SIZE AND LABOUR COSTS ON PROFITABILITY

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Abstract. It is important to examine profitability in the aviation sector and the factors that may affect it, due to their relevance for the airlines' survival. The main purpose of this paper is to analyse the effect of three internal business characteristics, namely labour costs, labour productivity and company size, on airlines' profitability, considering the airline type as a moderating effect. We have collected data of 190 European airlines during a 10-year period (2004–2013) which allowed us to create an unbalanced panel of 1,364 observations. Four types of airlines are considered. Results show that cost per employee has a positive influence on economic performance, especially for major carriers and regional carriers. It is also confirmed that the carrier type influences the relationship between labour costs, labour productivity and company size on the one hand, and economic returns on the other. These findings are relevant as they improve our understanding of economic profitability in different airlines' types.

Keywords: aviation, profitability, costs, airlines, labour productivity, economic performance.

Introduction

Across the years, the airline industry has been the subject of numerous studies in the academic literature. These have adopted different perspectives with respect to airline management (Ginieis, Sánchez-Rebull, & Campa-Planas, 2012). Several investigations have shown that air transport is a significant contributor to the economic, social, environmental impacts and cultural development of a country (Reynolds-Feighan, 2001; Soria-Baledón & Kosoy, 2018; Mohammadi-Amin & Karimi, 2018). The growth rates of air traffic and gross domestic product (GDP) are positively associated (Chin & Tay, 2001). The global air transport industry is still increasing and, in 2014, accounted for 63 million jobs and made a contribution of USD 2.7 trillion (3.5%) to global GDP (ATAG, 2014, 2016). Over the last 55 years, the air transport industry has an average annual growth rate equal to almost 10%, three times that of GDP (Oleshko & Heiets, 2018).

In 2015, more than 3.5 billion passengers used air transport, an increase of 6.4% on the previous year when there were 34 million flights (Novak, et al., 2019). In Europe, the airline industry was responsible for the direct employment of over 2.5 million people in 2014, and its

contribution to this region's GDP was around 192.8 billion USD. Considering the overall economic impact of aviation (direct, indirect, induced and tourism catalytic), European job creation would have been around 11.9 million jobs, and the sector's contribution to GDP around USD 860 billion (ATAG, 2016). In addition, in terms of infrastructure, airports have significantly contributed to their local economies (Button, 2003). The economic activity fostered by air transport is linked to economic growth, technological development, current globalization and the reduction of trade barriers between countries.

Over the last five years, global airline profitability has improved. These performance improvements are primarily caused by the industry consolidation and the restructuring strategies applied worldwide (Lopes et al., 2016). For example, in 2015, airlines generated an overall aggregate profit of USD 35.3 billion, primarily concentrated in North America (USD 22.9 billion) (IATA, 2016). A possible reason for these results relates to the higher profit margins in the airline industry due to lower fuel prices, increased passenger demand, significant appreciation of the US dollar and more seats occupied on flights (high load factors), as well as lower capital costs. The increase in

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the airlines' profitability has been also related to outsourcing (for example to low cost carriers).

Profitability is an important factor in any company's survival, and airlines are no exception. Many airlines have been forced to undertake significant restructuring strategies in order to reverse declining profits, by improving productivity and efficiency (Oum & Yu, 1998). However, although numerous studies have tried to explain company profitability, the main factors that influence this variable remain unconfirmed. In the air transportation sector, authors like Alamdari and Morrell (1997) have shown that the operating costs that airlines are subject to, and which affect profits, are influenced by both, by input prices (e.g. fuel costs, labour costs, airport taxes, etc.) and by operational characteristics pertinent to the airline type or model (e.g., a full service carrier (FSC), low cost carrier (LCC) or charter carrier (CHC) or, short, medium or long distance carriers).

The significant economic contribution of the airline industry, the inconclusive results of previous research on the factors that affect its profitability, the considerable inhomogeneity and the diversity of business models applied by airlines, all justify the interest of academia on this topic. The main issue analysed in the present study is the influence of employee costs and the size of different types of airlines on profitability. We seek to provide further empirical evidence on several internal variables affecting airline profitability, including labour costs and airline size, while taking into consideration differing airline types and business models.

1. Theoretical framework

Previous researches have studied the determinants of companies' profitability. These determinants can be classified as either external or internal factors. The former are related to the geographical area where companies are located and include the economic situation of the country, the characteristics of their industrial sector, market competition and market share (Schmalensee, 1985; Caloghirou et al., 2004; Ambrosius et al., 2016; Shen, 2017).

Regarding the airline industry, two external factors have especially attracted the attention of academics, the liberalization and deregulation of the aviation industry, and the zone or region where airlines are located. Prior to the liberalization of the sector, expectations were that airlines would attain higher profits (Oum & Yu, 1995, 1998). However, after deregulation, many airlines had to cope with increased pressure and competitiveness (Kalemba & Campa-Planas, 2019). Research by Sjögren and Söderberg (2011) shows that, overall, deregulation increased airline productivity, and consequently profitability, however this effect is not clear for those belonging to strategic alliances. A second well-researched external factor affecting profitability is the zone or region where an airline is located. Some studies find that European airlines, on average, have a higher level of profitability (measured in terms of the

rate of return on assets) than airlines in North America and Asia (Lee & Hooy, 2012).

The internal factors considered most relevant for the airline industry are based, firstly, on inter-firm heterogeneity, for example airlines size or cost structure, and secondly on the airlines' competitive strategies, such as their organizational models. Internal factors that influence profitability related to the company itself (Rumelt, 1991; Merkert & Pearson, 2015) include costs, labour productivity, company size, product characteristics, working capital, investments, assets, human resources, ownership and composition of corporate governing bodies, services quality, organization, strategies, etc. Clearly, there are numerous external and internal factors which need to be considered. Several studies have addressed the issue of the importance of an airline's costs. Gillen and Lall (2004), Tsoulakas et al., (2008), Berritella et al., (2009), Link et al. (2009), Maenhout and Vanhoucke (2011) determined that, for both traditional airlines and LCCs, fuel and staffing are the largest cost items. Tsoulakas et al. (2008) arrived at the same conclusion and claimed that together they represent approximately 50% of their overheads. Likewise, Doganis (2001) identified labour costs as one of the three critical areas that allow for cost reductions and consequent profitability increases in airlines.

Previous analysis shows that labour costs in the airline industry are closely linked to the business model applied. Several researches have shown that LCCs pay their employees less than do other airlines. Dobruszkes (2006) found that, despite having a greater workload, LCC staff are paid less than their counterparts in FSC companies. Similarly, Barkin et al. (1995) showed that, as compared to traditional airlines, LCCs in the US aviation market manage to save between 10 and 20% in personnel costs. A study by Najda (2003) claims that LCCs such as Southwest and JetBlue Airways have labour costs that are about 30% to 40% lower than those of traditional companies.

The second key internal factor under consideration is size. The formation of networks, fusions and alliances is an important feature of the sector, and affects the airlines' size (Oum et al., 2004). Airlines have constant investment needs and must keep their technology updated. There is an ongoing need for financial and human capital. This explains the high financial risks that affect their profitability (Capobianco & Fernandes, 2004). Literature on the subject indicates that larger size implies more available resources and also higher returns through economies of scale, synergies, greater strength in negotiating with suppliers and customers (Fariñas et al., 1992; Galve & Salas, 1993; González & Correa, 1998). These benefits would explain the proliferation of networks and strategic alliances within the sector.

Considerable research has been carried out on the relationship between the type or model of airline and its profitability. The results of the estimated cost model of different airline types proposed by Hansen et al. (2001) confirm the anticipated relationship between airline performance and its business model. These authors studied ten domestic

airlines in the US, and their results demonstrated that the business model explains flight delays, arising from disorganization and irregularity, and the cost structure for those airlines investigated.

Internal factors are also highly relevant since the company can manage them. Rumelt (1991) states that firm/business unit effects (internal factors) are more important than industry effects (external factors). In fact, previous research has tended to focus on internal factors, especially labour costs and productivity, and airlines' size, which are relevant to determining the competitive position of companies through their strategies and business models. Given the relevance of internal factors in explaining profitability in the airline industry, this work has a two-fold purpose:

1. it analyses and explains the direct relationship that exists between two internal characteristics of the airline (cost per employee and the size of the company) and the influence they exert on the economic profitability of the airline and,
2. the differences between these relationships are observed when comparing different types of airlines.

In this study, the personnel costs of European airlines are examined in order to have an understanding of the influence this variable may have on profitability in different types of airlines in Europe.

The paper is structured as follows. The next section outlines the methodology, describes the data gathering process, the measurement of the variables, and the analysis. Section 3 contains the results and the final section presents and discusses our main research conclusions.

2. Methodology

2.1. Data collection

To conduct this research, data for 190 European airlines over a period of ten years (2004–2013) were collected. This resulted in an unbalanced panel of 1,364 observations. The start year of 2004 was chosen because the Amadeus database then began publishing the financial statements of almost all the world's airlines.

Since the Amadeus database is one of the most relevant and used databases for the collection of financial and economic data from European companies, it was our primary source.

The airlines included in our sample fulfilled the following requirements:

- They had received favourable external audits during the period under consideration;
- They were required to present their individual financial statements every year;
- They were active companies.

2.2. Measuring the variables

The dependent variable of this study was the economic profitability of European airlines. This variable was measured using two different indicators (Campa-Planas et al.,

2011; Hernández et al., 2012). The first, economic profitability (EP1), was calculated as the percentage of operating results or earnings before interests and taxes (EBIT) from total company assets. The second, economic profitability ratio (EP2), was measured by dividing the EBIT by the average number of employees.

The first explanatory variable of this work was the unit cost per employee (CE) which has been used by numerous academics making comparative studies within the airline industry (Oum & Yu, 1995; 1998; Fernandes & Capobianco, 2001; Gudmundsson, 2004, Oum et al., 2005; Greer, 2008; Heracleous & Wirtz, 2009, Melo Filho et al., 2014). It is calculated by dividing the total costs for employees each year by the total number of staff employed in the same year.

Our second explanatory variable was the company size. We considered it appropriate to choose two different size indicators; the average number of employees (EMP) and the total assets (TA) (Campa-Planas et al., 2011; Hernández et al., 2012), both of them highly related to company's size in different economic sectors, and specifically in the airline industry (Heshmati & Kim, 2016).

This study also included the moderating effect of the categorical variable used to identify the airline type (TYPE). To categorize the different types of airlines, we mainly followed the guidelines proposed by Ginieis et al. (2013) but took into account a division in FSCs which necessitated adding another category. We included two FSCs subtypes: major carriers (MJC) and regional carriers (REC). Finally, we considered four different airline types: CHCs, LCCs, MJC and REC using a four-level categorical variable.

In our categorization, major carriers (MJC), included long-distance companies, airlines with a fleet of wide-bodied aircraft. Here we included flag carriers or traditional airlines (Lufthansa, Air France, British Airways, Iberia, etc.) and regular or legacy carriers (Virgin Atlantic Airways, Thomas Cook Airlines, Air Europa, etc.). MJC are usually members of strategic alliances in which partners require their members' commitment (Klophaus, 2005). They provide a higher level of service than low cost carriers (LCCs) (de Neufville, 2008; Neal, Kassens-Noor, 2011; Tretheway, 2011), especially during the flight (for example, food service and on-board entertainment). They usually offer first class or business class seats.

LCCs are different from conventional airlines and their business model is very simple (Srisaeng et al., 2014). They implement strategies to reduce costs such as using secondary airports because these tend to have lower airport charges (Pantazis & Liefner, 2006; Albers et al., 2010) and operate point-to-point systems. They reduce any "unnecessary" costs, such as claims for baggage loss (Graf, 2005) and operate a fleet of a single aircraft type, so they save on pilot and cabin crew training (Mason, 2000).

Regional carriers (REC) are those that operate only in regional area flying only within a comparatively small geographical area (Halpern, 2008) and providing an air

transportation service to communities with limited demand (Santana, 2009). Examples of RECs are the "feeder" companies of a flag-carrier or regular airlines.

An Air Charter Service (henceforth, CHC) does not market its services through the usual sales channels (Randøy & Strandenes, 1997). CHCs operate flights outside the usual scheduled times. Their flights are operated by contractual agreements with specific clients, or they are associated with specific tour operators (Halpern, 2008). Most regular airlines also occasionally provide charter services if they have spare capacity.

Finally, although the focus of this research is on airlines size and their labour costs, other variables exert impacts on profitability, some of them being specific of the airline industry as previously mentioned in the literature review. We decided to include some of them in our models to avoid problems of omitted variables, specifically fuel costs (FC) and labour productivity (LP).

Previous researches have established a relevant and negative influence of FC on profitability (Carter et al., 2003; Morrell, 2005). Carter et al. (2003) suggest that the cost of fuel is an important expense for any airline and has a significant impact on the profitability. Morrell (2005) indicates that the fuel is the second most significant cost for airlines, so it is important to control it. FC information has been collected from the airlines' Annual Reports for the years under study.

We also included a labour productivity indicator (LP), the operating revenue per employee. It allows us to estimate how much the employees contribute to the total operating income of the airlines and thus it is a measure of their performance. Jakšić et al., (2012) explain that there is a direct linear relationship between operating revenue and the number of employees, which means that more employees contribute to achieving greater operating revenue. The impact of productivity on profitability has been studied by diverse authors (Stierwald, 2010) and, in the specific case of the airline industry, several studies have found that productivity is a significant determinant of profitability (Mantin & Wang, 2012). Among different measures of productivity, labour productivity emerges as a relevant type due to its influence on the global productivity of the airline industry (Barbot et al., 2008; Parast & Fini, 2010).

All numeric variables were log-transformed to avoid problems with skewness and linearize their distributions. Standardized variable values were used in our analyses.

3. Results and discussion

We firstly undertook descriptive statistical tests and examined the correlation between variables. An ANOVA analysis was performed to evaluate the degree of association (or independence) between the variables. These analyses were complemented by performing multicollinear diagnoses to uncover any problems in the regressions. Model adequacy was analysed, and residual analysis diagnostics undertaken to confirm the efficiency of the model parameters following the steps pointed out by Tesfay and Solibakke (2015) and Tesfay (2016a, 2016b). Finally, a regression analysis estimated the relationships between the variables studied.

Table 1 shows the descriptive statistics and correlation matrix for the numerical variables. High correlations between some explanatory variables included in the same model can be observed. Besides, there was a high correlation between the two ratios of economic profitability, which suggests the suitability of analysing two different models, one for each of the indicators of economic profitability, thus gaining greater robustness in the results obtained. There was also correlation between the two independent variables that measure company size, but we decided not to include both of them in the same model, so the measurement of company size used in both models was different. Our multicollinearity diagnostics did not reveal any problems in the regressions. Every independent variable included in each model captured a relevant proportion of the variance. Variance inflation factor (VIF) analyses were conducted for each model, showing maximum values below the upper bound of 10, which suggests the absence of unacceptable multicollinearity.

For the categorical variables, such as airline type, the percentage of companies in each of these categories was calculated. Our sample indicated that CHCs represented 45.4% of the data, LCCs 7.5%, MJsCs 21.8%, and RECs 25.3%.

We noted that, according to the annual financial statements submitted by these companies during the 10-year period under study (2004–2013), MJsCs are the type with the

Table 1. Descriptive statistics and correlation matrix

Variables	mean	SD	Log EP1	Log EP2	Log CE	Log TA	Log EMP	Log CF	Log LP
Log EP1	-3.022	1.338	1						
Log EP2	9.228	1.624	0.760***	1					
Log CE	10.628	0.883	0.020	0.366***	1				
Log TA	17.822	2.096	-0.155***	0.141***	0.274***	1			
Log EMP	5.667	1.948	-0.115***	-0.163***	0.005	0.848***	1		
Log FC	12.635	1.095	0.046	0.224*	0.114	0.871***	0.837***	1	
Log LP	19.346	1.929	0.139***	0.550***	0.669***	0.143***	-0.214***	0.104	1

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

largest proportion of labour costs per operative revenues (approximately 24%), followed by the RECs (almost 20%), CHCs (around 14%) and LCCs (around 12%) (see Figure 1).

We conducted analyses of variance in order to determine whether some significant differences could be seen between companies of different types. Although it was not an objective of this investigation, we considered it appropriate to conduct prior exploratory analyses that determine differences among airline types in order to later justify the explanatory models used in this research. This is due to the expected impact that the airline type could exert on the effects of labour costs and airline size over profitability. The following tables and figures show the most relevant results.

Tables 2 and 3 (Figures 2, 3) show that the mean values of economic profitability were significantly different when comparing airline types. MJC presents the lowest mean values for both types of economic profitability, whilst

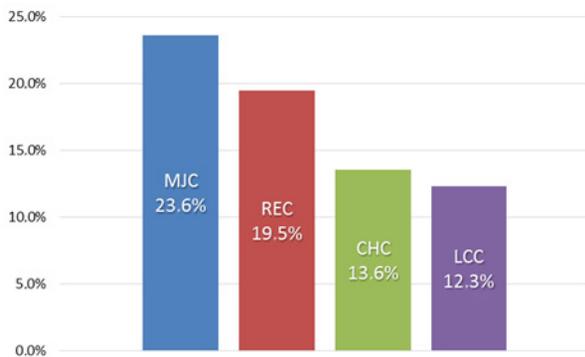


Figure 1. Personnel costs in terms of operating revenue for airline type (source: created by the authors)

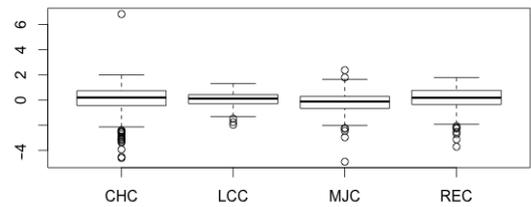


Figure 2. Boxplot for EP1 by company type (source: created by the authors)

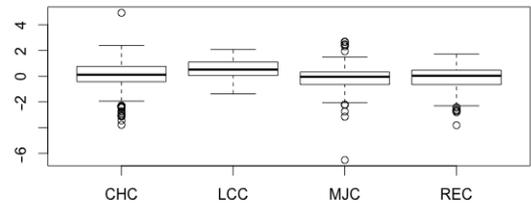


Figure 3. Boxplot for EP2 by company type (source: created by the authors)

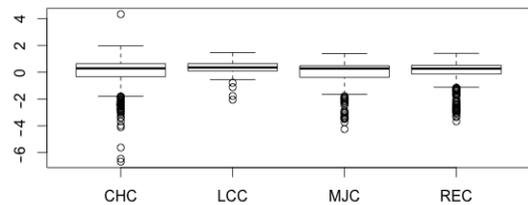


Figure 4. Boxplot for CE by company type (source: created by the authors)

Table 2. ANOVA analysis for EP1

Variable	CHC		LCC		MJC		REC		ANOVA F
	mean	SD	mean	SD	mean	SD	mean	SD	
Log EP1	0.041	1.084	0.018	0.678	-0.221	0.917	0.079	0.942	3.349*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 '.' 1.

Table 3. ANOVA analysis for EP2

Variable	CHC		LCC		MJC		REC		ANOVA F
	mean	SD	mean	SD	mean	SD	mean	SD	
Log EP2	0.033	1.005	0.510	0.741	-0.134	1.069	-0.113	0.954	7.57***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 '.' 1.

Table 4. ANOVA analysis for CE

Variable	CHC		LCC		MJC		REC		ANOVA F
	mean	SD	mean	SD	mean	SD	mean	SD	
Log CE	0.002	1.085	0.334	0.540	-0.093	0.976	-0.022	0.948	4.739**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 '.' 1.

RECs exhibit the highest mean value for EP1, and LCCs the highest mean value for EP2.

These results show that the assets of RECs generate higher income than other airline types (see EP1). Larger airlines, such as MJC's show lower averages. In EP2, we see that LCCs employees are the most productive of all types, whereas the employees of the MJC's are the least productive.

In terms of the first explanatory variable, unit cost per employee (CE), Table 4 and Figure 4 show significant differences in their mean value when comparing different types of airlines, being the highest in the case of LCCs and the lowest for MJC's.

We have provided two possible explanations to this somewhat controversial result. First, in this study we have considered the cost of staff in general, instead of the employees' basic wage. LCCs have fewer personnel than traditional airlines, but their staff work more hours, which means that they pay them overtime and other allowances, and this might affect the final results of this research. Another possible explanation is that we compared the costs for employees without discriminating between labour categories – in the MJC's there are more labour categories and higher wages gaps between employees. Furthermore, our dataset contains only a few LCCs from Eastern Europe, while there are many airlines of other types (MJC's, REC's and CHC's) in Russia, Ukraine, Romania and Bulgaria. This also may affect average labour costs when comparing region by region.

The results for company size are shown in the following tables and figures.

When reviewing the results for the measurements of company size (Tables 5, 6 and Figures 5, 6), some relevant and significant differences can be observed when comparing different airlines types. MJC's and LCCs exhibit higher mean values in terms of company size (considering both

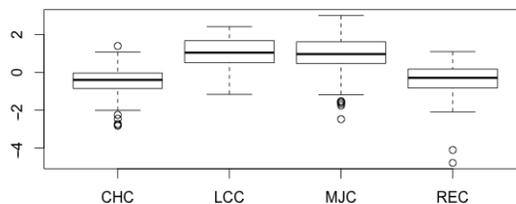


Figure 5. Boxplot for TA by company type (source: created by the authors)

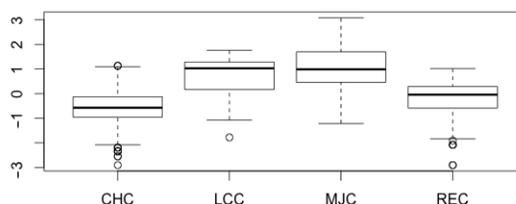


Figure 6. Boxplot for EMP by company type (source: created by the authors)

total assets and employee numbers) when compared to REC's and CHC's.

This can be explained as follows. LCCs and MJC's have fleets with long-haul aircraft and large fuselage width (and modern fleets, in the case of LCCs), which increase their asset values. However, the aircrafts used by REC's or CHC's, which are normally used for short-haul flights, are smaller. So, when compared to other airlines with larger aircraft, their assets are of a lower value. With regard to the EMP variable, MJC's are assumed to have higher staff numbers with respect to CHC's.

The results for the fuel costs are displayed in Table 7 and Figure 7.

Table 5. ANOVA analysis for TA

Variable	CHC		LCC		MJC		REC		ANOVA
	mean	SD	mean	SD	mean	SD	mean	SD	F
Log TA	-0.465	0.619	1.039	0.845	0.994	0.976	-0.327	0.757	330***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

Table 6. ANOVA analysis for EMP

Variable	CHC		LCC		MJC		REC		ANOVA
	mean	SD	mean	SD	mean	SD	mean	SD	F
Log EMP	-0.557	0.650	0.744	0.758	1.109	0.903	-0.174	0.719	383.1***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

Table 7. ANOVA analysis for FC

Variable	CHC		LCC		MJC		REC		ANOVA
	mean	SD	mean	SD	mean	SD	mean	SD	F
Log FC	-1.424	0.851	0.076	0.452	0.345	0.875	-1.805	0.606	53.21***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

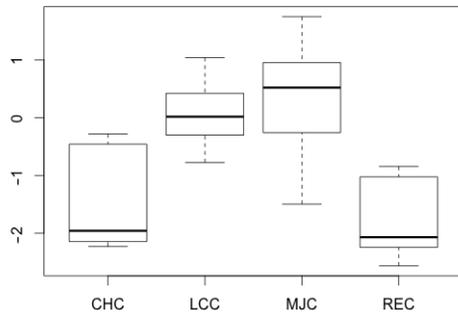


Figure 7. Boxplot for FC by company type (source: created by the authors)

Table 7 and Figure 7 show some relevant and significant differences in terms of fuel costs when comparing different airlines types. MJC and LCCs exhibit higher mean values than RECs and CHCs, but MJC is the type with the highest fuel costs.

According to our results, RECs and CHCs have managed to protect themselves from the constant changes in fuel prices and have obtained lower fuel costs than larger companies such as the MJC and LCC. This finding is noteworthy and deserves to be further studied because the study carried out by the European Cockpit Association (ECA, 2006), indicates that CHCs are amongst the most affected airlines when compared to LCCs and MJC since, in the short term, they are not able to react to fuel price changes.

Finally, the results for labour productivity (LP) are shown in Table 8 and Figure 8.

The results of Table 8 and Figure 8 show significant differences in the mean values of labour productivity when comparing different types of airlines. According to our results, LCCs are the airlines with higher labour productivity.

Following on this exploratory analysis and given that the database combines observations of airlines across time, panel data methodology was used in the estimation process. We conducted random effects regression analyses as suggested by the results of the Durwin-Wu-Hausman test (Table 9). We also included time dummies in the panel regression models.

For the purpose of this study, in which we have tried to determine, on the one hand, the influence of costs per employees and company size on economic profitability in the airline sector, and on the other, the possible differences that can be expected between these effects, depending on airline types, we considered it appropriate to specify two

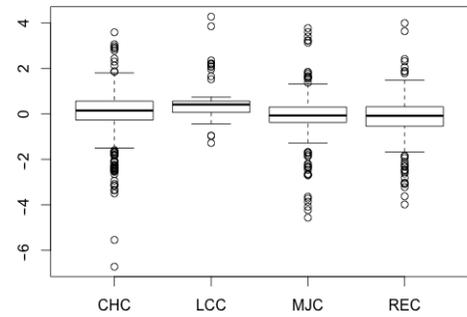


Figure 8. Boxplot for LP by company (source: created by the authors)

models. Each model involves a different measurement of economic profitability.

In the first model, where the dependent variable was EP1 (EBIT/TA), company size was determined by means of the number of employees. In the second model, where the dependent variable was EP2 (EBIT/EMP), we included total assets as one of the explanatory variables.

To investigate whether airline type would strengthen or weaken the effect of cost per employee and company size on economic profitability, the following moderated regression equations were utilized:

$$EP1_{it} = \beta_0 + \beta_1 Year + \beta_2 (FC)_{it} + \beta_3 (LP)_{it} + (\beta_4 (CE)_{it} + \beta_5 (EMP)_{it}) \cdot TYPE_{it} + it; \tag{1}$$

$$EP2_{it} = \beta_0 + \beta_1 Year + \beta_2 (FC)_{it} + \beta_3 (LP)_{it} + (\beta_4 (CE)_{it} + \beta_5 (TA)_{it}) \cdot TYPE_{it} + it. \tag{2}$$

As mentioned above, to analyse the adequacy and diagnosis of the model through residual analysis and to confirm the efficiency of the model parameters, we followed the steps described by Tesfay and Solibakke (2015) and Tesfay (2016a, 2016b). Firstly, we computed the estimated residuals. Then, we applied the Ljung-Box test of serial autocorrelation on the estimated residuals for both models. We did not reject the null-hypotheses because autocorrelations were small and non-significant (Ljung-Box Q Chi-Sq = 24.962, *p*-value = 0.1618 for EP1; Ljung-Box Q Chi-Sq = 23.841, *p*-value = 0.1823 for EP2). These results imply that the models fit can be considered free from autocorrelation problems.

Results from Table 9 confirm the influence of costs per employee on economic profitability. The influence is positive and significant in both models ($\beta = 2.605$; *p*-value < 0.01 for EP1, and $\beta = 1.568$; *p*-value < 0.05 for EP2). Regarding size, effects were only significant in

Table 8. ANOVA analysis for LP

Variable	CHC		LCC		MJC		REC		ANOVA
	mean	SD	mean	SD	mean	SD	Mean	SD	F
Log LP	0.067	0.999	0.474	0.812	-0.143	1.056	-0.137	0.949	12.95***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 '.' 1.

Table 9. Results of the random effects regression analyses

Variables	Model 1 (Dependent variable EP1)		Model 2 (Dependent variable EP2)	
	B	Std. Error	B	Std. Error
Intercept	0.336	0.592	0.125	0.548
Year 2005	-0.144	0.306	-0.095	0.251
Year 2006	-0.505	0.278+	-0.447	0.231+
Year 2007	-0.020	0.260	-0.060	0.214
Year 2008	-0.041	0.293	-0.079	0.248
Year 2009	-0.333	0.277	-0.321	0.232
Year 2010	-0.274	0.293	-0.248	0.246
Year 2011	-0.367	0.283	-0.347	0.242
Year 2012	-0.356	0.285	-0.316	0.245
Year 2013	-0.099	0.278	-0.109	0.241
FC	0.080	0.238	0.089	0.222
LP	0.254	0.208	0.674	0.140***
CE	2.605	0.918**	1.568	0.617*
EMP	1.991	0.830*		
TA			0.626	0.848
LCC	-0.083	0.632	-0.221	0.554
MJC	-0.199	0.438	0.001	0.429
REC	0.499	0.811	-0.050	0.533
CE*LCC	-2.855	0.999**	-1.628	0.698*
CE*MJC	-2.636	0.936**	-1.445	0.633*
CE*REC	-1.929	1.107+	-1.968	0.825*
TA*LCC			-0.320	0.851
TA*MJC			-0.637	0.863
TA*REC			0.872	1.182
EMP*LCC	-2.111	0.870*		
EMP*MJC	-2.054	0.840*		
EMP*REC	-3.477	1.808+		
Hausman test	6.122 (p-value 0.9976)		8.470 (p-value 0.9813)	
Adjusted R-Squared	0.167		0.379	
F	1.572 +		4.154***	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '+' 0.1 '.' 1.

the case of the number of employees on EP1 ($\beta = 1.991$; p-value < 0.05), meaning that a higher company size, in terms of number of employees, improves economic profitability, while a non-significant effect was found between total assets and EP2. These results refer to CHC airlines, which are the baseline of these analyses.

Regarding the airline type, non-significant effects were found in both models, which points out that the airline type, by itself, does not exert a significant effect on profitability.

The moderating effects of an airline's type on the relationship between CE and profitability were negative and significant in the case of LCC ($\beta = -2.855$; p-value < 0.01 for EP1 and $\beta = -1.628$; p-value < 0.05 for EP2). This implies that the positive effect proven between CE and profitability for CHC, becomes negative for LCC. In the case

of MJC, these moderating effects were also negative and significant in both models ($\beta = -2.636$; p-value < 0.01 for EP1 and $\beta = -1.445$; p-value < 0.05 for EP2), which also suggest a lower impact of CE on profitability when comparing MJC to CHC. This influence of CE even becomes negative on EP1 in MJC, and it is positive on EP2, but much lower when comparing MJC to CHC. In the case of REC, again, the moderating effects were negative and significant in both models ($\beta = -1.929$; p-value < 0.1 for EP1 and $\beta = -1.968$; p-value < 0.05 for EP2). These results mean that the influence of CE on EP1 is positive for REC but lower in comparison to CHC, and negative in the case of EP2.

Finally, the moderating effects of the airline type on the relationship between the number of employees and EP1 were negative and significant for LCC ($\beta = -2.111$;

p -value < 0.05), MJC ($\beta = -2.054$; p -value < 0.05) and REC ($\beta = -3.477$; p -value < 0.1). These results imply that the positive influence between the number of employees and EP1 proven for CHC ($\beta = 1.991$; p -value < 0.05) becomes negative for other airline types. Non-significant effects were found in the relationships of total assets and EP2, when the moderating influence of the airline type is considered.

Regarding the rest of the variables included in our models, fuel cost and labour productivity, the results indicate non-significant influence of these variables on profitability, the only exception being of LP which has a positive and significant influence on EP2 ($\beta = 0.674$; p -value < 0.001). This means that airlines with a high labour productivity obtain high economic profitability measured in terms of the number of employees. The effect of time was not proven significant with our dataset.

Conclusions

On the one hand, our purpose was to explore the direct relationship that cost per employee and company size, as internal airline characteristics, exert on economic profitability in the sector. On the other hand, we were interested in discovering whether relevant differences could be observed in these relationships when comparing different airline types. The originality of this work is its analysis of two models including two different economic variables (profitability over assets and profitability per employee), while at the same time four types of airlines are compared.

The findings of this study underlined an influence of cost per employee on economic profitability for CHC. This effect was positive and independent of the way of measuring this profitability, much higher than for MJC and REC while was negative for LCC. Regarding the company size, only when measured by the number of employees, it was observed a positive relationship with economic profitability in the case of CHC carriers, implying that a higher number of employees in this airline type is related to higher economic profitability (as measured as EBIT divided by total assets). One possible explanation for these results is that CHC airlines in our dataset are mostly airlines that carry out executive and business flights. Therefore, they can better manage their costs and thus achieve greater profitability since they mainly work with previously booked flights, in which they can assure and increase their economic profitability even when their cost structure in terms of personnel and size are high. In this type of airlines, the influence of the airline size in terms of the number of employees on economic profitability is positive. On the contrary, in the other airline types, a lower size and also lower costs structures assure a better performance in terms of economic profitability. Nevertheless, further exploration of

the possible reasons for the results obtained in this study will constitute an interesting research line for the future.

A direct influence was also observed in the case of labour productivity, which demonstrates the positive effect of labour productivity on economic performance, at least when measured as EBIT per employee. Thus, we may assert that an airline's economic profitability depends on the cost per employee, the airline's size and the labour productivity (although the level of influence of some of these variables is not the same for all types of airlines, being higher or lower depending on the type of airline under consideration). These important differences exhibited by different airline types confirm that the airline industry is not a homogenous sector, and the relevance of considering the potential impact of these differences exhibited by each airline type and its business model.

This research, nevertheless, has several limitations that might be addressed in the future. We have considered employee costs without discriminating between labour categories and we have not considered wage gaps among employees when comparing airlines in different geographical regions or countries. Also, studying labour costs in different geographical areas, while taking into account existing gaps and different national degrees of inflation, would be an interesting analysis to carry out in the future, as it would allow us to better explore the influence of these variables on profitability. Furthermore, although the ratios used in this study are the most commonly applied when measuring firms' profitability, other variables might also add valuable information to the characteristics and performance of airline companies. Another important limitation was the impossibility of showing with our dataset the significant influence of fuel cost on economic profitability established in earlier research. The inclusion of more airlines and years could provide more data and contribute to solving this problem in the future. Finally, the inclusion of additional explanatory variables, such as the number of fleet or the material costs, was considered in this study because of their potential influence on profitability. However, problems of multicollinearity were observed between several such explanatory variables when tested them in our models, and also the number of observations was reduced due to missing data issues.

Finally, we consider that this paper contributes to the existing literature responding to several relevant but previously unanswered questions in the airline industry, and provides a more in-depth understanding of economic profitability in the sector, which may be useful for further studies and for managers in the air transport sector. Specific insights are provided regarding the economic profitability of different types of carriers which adopt different business models, which aid in understand the effect of labour costs and airline size on economic profitability.

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