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THE RELATIONSHIP BETWEEN ROMANIAN AVIATION INDUSTRY TURNOVER AND NATIONAL GDP

Abstract

Since its emergence, at the beginning of the 20th century, the national aviation industry was considered one of the top industries. Acknowledging the potential of the industry, we try to focus our attention towards the status of several long established aviation company and the wellbeing of the economy as a whole. The purpose of this paper is to establish a correlation between the turnover of the most important aerospace companies and the gross domestic product (GDP). In order to achieve the research aim, a linear regression was designed. Following market dynamics the study shows a direct relationship between the specific company turnover and national GDP in the case of Romanian entities operating in aeronautic industry. This relationship confirms Maslow's hierarchy of needs.

Keywords

Aviation industry, GDP, Linear regression, Romania, Turnover

1. Introduction

One of the main business function, on which this study is based on, is the marketing function. It ensures that the goods and services are delivered from the producer to the consumer by using market research, advertising, and most importantly sales (Bund and Carroll, 1957; Krasnikov and Jayachandran, 2008; http://www.mindset.co.za/learn/node/47533/5#). The sum of products sales and/or services rendered at microeconomic level represents the company's turnover (Dictionary of Economics, 2001). Seen on a bigger scale, it assembles the gross domestic product (GDP).

In order to provide a better understanding of the relationship between the two indicators (turnover and GDP), we decided to conduct an analysis at sector level. Thereby we compiled a simple linear regression that should confirm or not the relationship between the sectors turnover and the 'national' turnover (GDP). Using the collected data from the relevant companies, on a five year period, we managed to rebuild the regression for enterprise-level study, resulting the same type of direct connection between the variables.

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2. Literature review

System of National Accounts is a concept used by all nations in the world. The first set of such accounts was explained in a report to the U.S. Congress in 1934, drafted by the Bureau of Foreign and Domestic Commerce and National Bureau of Economic under the management of Simon Kuznets (Bureau of Foreign and Domestic Commerce and National Bureau of Economic Research, 1934). Alongside Kuznets, professor Richard Stone has laid the groundwork for the UK National accounts in 1938. Both have later received a Nobel prize for their findings.

The concept, organization and functioning of national accounting systems of most countries is today under the auspices of the National Accounts System of the United Nations (SNA), which is in force from 1995, with the 1993 version, that has replaced the one from 1968. All European Union countries have gradually adopted directives now fit into the European System of Accounts (ESA). In the case of Romania, the European system of national and regional accounts with the 1995 version (SEC-95) was implemented starting 1998.

Previous research that studied the history and importance of using national accounts have set GDP as the main reference indicator of the economy (Raipuria, 2002; Hein and Tarassow, 2010; Ben-Ami, 2013, Kulshreshtha and Singh, 1996; Matkowski, 2004; Mohanty and Raghavan, 1990; Kansal, 1992; Jalali-Naini, 2005; Hosein and Lewis, 2005). GDP estimates helped in assessing the economy's overall productive capacity and the impact of moving from consumer spending on goods and services to government expenditure (Landefeld, Seskin and Fraumeni, 2008).

Seen as a stand-alone index, GDP depicts the main needs and demands of the population, if calculated using the expenditure approach. Most often, GDP is considered to be a value added index (Kulshreshtha and Singh, 1996; Ben-Ami, 2013).

At industry level, the indicator that best represents the companies status is the turnover. The turnover consists of all revenues obtained by current activities namely the sales of goods and services rendered, including subsidies, after deducting commercial discounts offered to customers. The turnover does not include financial and extraordinary income. The concept of turnover can be classified into several categories: net turnover, average turnover, marginal turnover and critical turnover, each highlighting a different aspect of the company activity. (Minister of Public Finance Order, 94/2001; Niculescu, 1997; Vâlceanu, Robu and Georgescu, 2005; Carcello, 2008).

3. Research design

The aviation industry includes all activities that results in added value (namely GDP) by manufacturing aero structures, components, assemblies; production and integration of electronic systems, communication and IFF systems; MRO (maintenance, repair and overhaul) and upgrades of military and commercial aircrafts.

With the purpose of demonstrating the relationship between the two variables, we collected the required data from Ministry of Finance, Bucharest Stock Exchange, Eurostat.

	Company name	NACE Code	Analyzed period
1	Aerostar	35.30 – Manufacture of aircraft and spacecraft	2008-2012
2	Eurocopter	35.30 – Manufacture of aircraft and spacecraft	2008-2012
3	Unison Engine Components	35.30 – Manufacture of aircraft and spacecraft	2008-2012
4	Romaero	35.30 – Manufacture of aircraft and spacecraft	2008-2012
5	Turbomecanica	35.30 – Manufacture of aircraft and spacecraft	2008-2012
6	Avioane Craiova	35.30 – Manufacture of aircraft and spacecraft	2008-2012

Table 1: *Sample Data*

Therefore, we collected data for the major companies in this sector: six entities operating in the aviation industry that are listed on the Bucharest Stock Exchange (Tier I, II and III) as can be seen in Table 1. All these companies, considered captive suppliers (Sturgeon, 2002; Sturgeon and Lee, 2001), were analyzed over a period of five years, from 2008 to 2012.

3.1. Hypotheses Development

The main purpose of this study is to analyze the link between turnover at sector level and GDP. In order to reach the aim of the research, the following two research hypothesis were developed:

- Hypothesis 1 (H1): There is a significant positive relationship between turnover at sector level and national GDP.
- Hypothesis 2 (H2): There is a significant positive relationship between turnover of enterprise-level operating system aviation industry and national GDP.

3.2. Regression Model

After establishing clear objectives, it was concluded that the best approach in solving the theory is by using linear regression.

The following regression model was used to test whether there is an association between turnover and GDP of entities operating in the aviation industry in Romania.

$$(H1)\ R1: GDP1 = \alpha 1 + \beta 1 TTTS + \varepsilon 1i$$

$$(H1)\ R2: GDP2 = \alpha 2 + \sum \beta 2i TTit + \varepsilon 2i$$

The dependent variable is represented by the gross domestic product (GDP). The independent variables are represented by the turnover at sector level (TTTS) – in the first

regression, and the turnover of each analysed company (TTi), where i stands for the serial number from Table 1, t represents the year and ε is the error term.

3.3. Regression Analysis

3.3.1. Regression statistics

In order to analyse the two hypothesis, we performed a logistic regression analysis. Table 2 and Table 3 present the regression statistics. Thus, if we analyse the overall accuracy of the regression, we find a close relationship between the two variables in the first hypothesis (R2 is a little over 80%). For the second hypothesis we find an R2 of 0,0081 that implies that only 0,8% of the variance of the output variable is explained by the variance of the input variable.

Table 2. Regression statistics for H1*Regression Statistics*	
Multiple R	0,911420582
R Square	0,830687478
Adjusted R Square	0,774249971
Standard Error	16627287684
Observations	5

Table 2: *Regression statistics for H1*

Regression Statistics	
Multiple R	0,090376747
R Square	0,008167956
Adjusted R Square	-0,027254617
Standard Error	32266597825
Observations	30

Table 3: *Regression statistics for H2*

3.3.2. Analysis of Variance

In the ANOVA analysis, we study to what extend to regression result is not accidental. The most important indicator is the value of Significance F. In case of Hypothesis 1 (Table 4), there is a probability of 3% that the regression results are random, where in case of the second hypothesis, there is a probability of over 60%.

	df	***SS***	***MS***	***F***	***Significance F***
Regression	1	4,07E+21	4,07E+21	14,71871	0,031223
Residual	3	8,29E+20	2,76E+20		
Total	4	4,9E+21			

Table 4: *Regression – Analysis of Variance (ANOVA) for H1*

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2,40071E+20	2,40071E+20	0,230586196	0,634819825
Residual	28	2,91517E+22	1,04113E+21		
Total	29	2,93918E+22			

Table 5: *Regression – Analysis of Variance (ANOVA) for H2*

3.3.3. Regression Output

Reliability of the regression, presented in Table 5 for H1 and Table 6 for H2, is better noted by the P-value indicator. It represents the probability that the value of the two indicators (α and β) to be random. In the case of H1, the P-value of the intercept (α1) is <1% and in the case of independent variables (β1), 3%, that implies that there is a probability of more than 95% in both cases that the value of the coefficients may not be happenstance.

In Assumption 2, the P-value for α2 is a insignificant, but the significance for β 2 is a little over 60% that indicates that the result is not reliable.

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	3,6802E+11	4,46E+10	8,25133	0,00372	2,26E+11	5,1E+11	2,26E+11	5,1E+11
TT_{TS}	303,741650	79,1716	3,836498	0,031223	51,78228	555,701	51,78228	555,701

Table 6: *Regression Output for H1*

	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**	**Lower 95,0%**	**Upper 95,0%**
Intercept	5,321E+11	11293572	47,11717	3,25096E-28	5,08987E+11	5,5525E+11	5,08987E+11	5,5525E+11
TT_{it}	56,28400	117,2109	0,480193	0,63481982	-183,8118227	296,37983	-183,8118227	296,3798

Table 7: *Regression Output for H2*

Taking into account the results of the regression analysis we can confirm the first hypothesis. Thus, it shows that there is a positive relationship between the aeronautics industry total turnover and the national GDP. In case of the second hypothesis, we cannot say with certainty that there is a correlation between the variables analysed seeing that there are numerous indicators that favour randomness.

4. Conclusions and further research

This study aims to analyse the link between the aerospace industry companies turnover and the national GDP over a five year period – since 2008 to 2012.To archive the goal of this paper, we have developed two hypothesis regarding the connection between the aerospace industry and the national GDP.

The results of the study show that there is a positive correlation between turnover of the sector and GDP (H1) but we couldn't demonstrate any relation between the turnover of the most important aerospace companies and GDP (H2).

Considering the history and tradition of each company presented in this study, we concluded that they are profit-led, thus confirming the seminal theoretical conclusions of Bowles and Boyer (1995) and Bhaduri and Marglin (1990).

There are a few drawbacks of this study. First of all the population is undersized, but the fact that the same companies were analyzed for the entire period stated in the study, increases the relevance of the observations. Second, the independent variable is not set to the completely main component of GDP.

Regarding further research, there is a wide range of possibilities. For example, the population can be extended to all companies listed on the Bucharest Stock Exchange. Also, a comparative analysis can be drafted studying the relation between the Romanian aeronautical industry and a similar sector from another emerging country, research regarding the linkage between turnover at sector-level and GDP.

In many theoretical models, the main factor determining economic growth is gross capital formation (Matkowski, 2004). Thus a future research will focus on analyzing the influence capital formation on value added.

An interesting approach towards the companies turnover would be by analysing the main stakeholders influence on it. Marketing of products and services on international markets instead of a domestic one can bring a change in turnover. Following the same line of thought, we can observe nationwide the grounds for aeronautical production imports (e.g. insufficient or inadequate domestic production) and adjusting it for a higher competitiveness thus becoming an issue of global buyers and performance of local suppliers.

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