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## The Air Freight Transport at Spanish Airports: Towards Selective Concentration and Internationalization

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### 1. INTRODUCTION

Globalization has fundamentally modified the organization of the global economy, intensifying the integration and interdependence of cross-border economic activity (Coe, N. M. & Yeung, H. W.-c., 2015). Therefore, transport is fundamental for the development of globalization at all scales and in all areas. Producers and consumers around the world are now connected through fast and efficient transport, logistics and telecommunications systems that are reconfiguring traditional supply and distribution networks (Dilian, C. D. & White, C. L., 2010). These processes have important effects on the international scene but also in local spaces. Central and intermediate locations are identified as spatial qualities that improve the traffic levels of the transportation centers and, therefore, indicate which places are strategically located within the global or regional transportation systems (Fleming, D. K. & Hayuth, Y., 1994).

In this context, air freight transport is an insignificant part of the total of goods movements despite its strategic role in international trade (Yamaguchi, K., 2008), because it is determinant in sectors with high added value and in those that require an immediate distribution (Morrell, P. S., 2011). Air transport can be understood as a practice that allows us to assess the interconnectivity processes that take place in the global order (Gago García, C. & Córdoba Ordóñez, J. A., 2013). The research carried out focuses mainly on the analysis of the structure and flows of air freight transport networks (Matsumoto, H., 2004; Derudder, B. *et al.*, 2008; Mayer, R., 2016; Sales, M., 2017); as well as in the case study for airport terminals, products and companies (Hesse, M., 2014; Lotti, R., and Caetano, M., 2018; Balliau, M., *et al.*, 2018; *i.e.*). Spanish literature



on this subject is scarce, contrasting with the variety of the research that focus on passengers transportation and airport terminals (Martí-Henneberg, J. *et al.*, 2007; Tapiador, F. J. *et al.*, 2008; Escalona, A. I., and Ramos, D., 2010; i.e.).

Because of their interest in economic development, it is important that planners and stakeholders understand changes in global air networks in order to assess the positioning and hierarchy of cities and territories. In this context, this work advances in the interpretation of the flows of air cargo with the objective of appraise the insertion of Spanish airports in the global distribution networks.

## 2. GLOBAL AIR CARGO HIERARCHY

Air freight transport represents a minor mode over the total volume of world cargo, although its economic value makes it strategic. The aerial distribution of goods is concentrated in a selection of main flows where a reduced number of airports act as central nodes of the system (Guimerà, R. & Amaral, L. A. N., 2004). 86.3% of global merchandise transported by air in 2016 passed through the twenty main airports, the 94.1% in the case of twenty biggest European Union airports, showing the high concentration of the sector. These airports act as hubs of goods as happens with passenger traffic (O'Kelly, 1998). Its location, whether central or intermediate in the global system (Fleming, D. K. & Hayuth, Y., 1994), matches with strategic spaces located within the global supply chain. Most of these airports are global hubs for passenger traffic; although the needs required for air cargo transport means that some airports that do not have special interest for passenger traffic and are not located in central geographic areas are being configured as optimal nodes for the transport of goods (Behrens, K., 2007) in a role of intermediary terminals, especially when it locates the headquarters of cargo airline companies.

## 3. DATA AND METHODS

In order to analyze the situation and evolution of air cargo in the Spanish airport system, information has been obtained from the statistical service of AENA, a Spanish public company that manages 48 airports. The total volume of cargo managed (2000-2017) and the number of international connections (at the country level) (2004-2017) have been considered as variables to analyze the following issues:

1. The evolution of the total air cargo volume for the period 2000-2017.
2. The variation in the number of international connections according to the number of countries with origin/destination of air cargo in each airport for the period 2004-2017.
3. The evolution of cargo according to origin/destination by volume: national, European Union, rest of Europe, and extra-Europe.

## 4. FINDINGS

### 4.1. Evolution of air cargo volume

Between 2000 and 2017 the Spanish airport network increased the total volume of freight by 48.6%, from 617,808 t in the year 2000 to 918,305 t in 2017. It should be highlighted that the number of airports operating goods has been reduced from 39 in the year 2000 to 34 in 2017, although in the same period the number of airports operated by AENA increased from 42 to 48. In recent years, the twenty main Spanish cargo airports (which account for 99.5% of the total volume in 2004 and 99.9% in 2017) are maintained without the emergence of others. However, internal variations are appreciated, especially in the upper-middle part of the classification: Madrid (1<sup>st</sup>) and Barcelona (2<sup>nd</sup>) have not changed their positions in the hierarchy, while Vitoria has lost one (3<sup>rd</sup> in 2004 and 4<sup>th</sup> in 2017) and Zaragoza climbs to the 3<sup>rd</sup> position, replacing Gran Canaria and surpassing other island airports.



The four main air cargo airports in 2017 increase from 71.1% to 90.3% in 2017 of total volume between 2000 and 2017, showing the concentration of the air cargo sector. In this group excels Madrid-Barajas, gathering 51.3% of the total cargo volume in 2017, a figure that has remained constant since 2000 (50.3%). Next, Barcelona-El Prat has increased its weight in the system, going from 14.4% to 17% of the total volume. Both airports benefit from being the main national hubs for passenger traffic, which means being able to take advantage of international and long-haul flights. Moreover, two secondary airports with little relevance in passenger traffic present an important cargo role, Zaragoza with 15.5% of the total volume and Vitoria with 6.6%. These airports are specialized in the operation of cargo flights due to their strategic location, excellent accessibility and little congestion.

#### 4.2. Variation in the number of international connections

The organization of air cargo presents a diversity of origins and destinations that has evolved in a different way and intensity. Between 2004 and 2017, there were no significant changes since the number of countries with goods exchanges has increased from 93 to 103, and the number of airports has decreased from 382 to 374. There is thus a positive trend towards the internationalization of destinations with a slight increase that, however, is variable between each year, but without implying the existence of a wider network of connected airports. There are nuances between the four main airports. By countries, all except Vitoria have increased the number of origins/destinations, highlighting especially the increase of Zaragoza. Madrid boasts the highest level of internationalization, followed by Barcelona, Zaragoza and Vitoria.

#### 4.3. Evolution of cargo according to origin/destination

Finally, the results are presented according to the origin/destination of the cargo according to its geographical scope:

1. The freight between Spanish airports decreases significantly, with Madrid, Barcelona and Vitoria being representative.
2. The exchange with the countries of the European Union remains stable in Madrid and Vitoria, while losing weight in Barcelona and Zaragoza.
3. Madrid and Barcelona increase slightly the traffic with other European airports, while in Vitoria is insignificant and Zaragoza loses this connection.
4. Exchanges with airports from other continents grow in Madrid, increase significantly in Zaragoza and Barcelona, and disappear in Vitoria.

### 5. DISCUSSION AND CONCLUSION

The results present how the volume of air cargo in Spanish airports has increased significantly and how the activity has been concentrated in a smaller number of airports, following a process of concentration in the management of air cargo parallel to the global scheme, as suggested by other investigations (Sales, M., 2017; Wong, W. H. *et al.*, 2019). In this context, certain cities or regions hierarchize global flows (Smith, D. A., and Timberlake, M. F., 2001), specializing in a complex logistics economy that responds to the new models of the global economy. It should also be noted that despite the increase in the total cargo handled, the freight transported between Spanish airports maintain a negative trend while they significantly increase the volumes to and from abroad, especially with countries outside the European Union. For this, Madrid and Barcelona are the main nodes between the global and international systems. However, from the analysis carried out, it is worth reflecting on the role that intermediate airports are acquiring (Zaragoza and Vitoria), to which additional traffic can be given if they are favored by carriers as connection centers or relay points in the system (Fleming, D. K. & Hayuth, Y., 1994).



The increase in the volume of cargo in Spain contrasts with a mere increase in the number of connected countries and a slight drop in airports, which would show the configuration of an international network of specialized air cargo hubs following the pattern of passengers (Bryan, D. L. & O'Kelly, M. E., 1999). The recent improvement and expansion of airport infrastructures in Spain have made possible the conversion of the Iberian Peninsula into a strategic hub for Europe and Latin America that takes advantage of the growing links with Africa and Asia; and where the increase of e-commerce will lead to new demands in logistics related to air transport.