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AIRPORT NON-AERONAUTICAL REVENUES INDEPENDENT OF PASSENGER TRAFFIC AS A WAY TO BUILD RESILIENCE TO DECLINES IN PASSENGERS NUMBERS

Paweł ZAGRAJEK

Szkoła Główna Handlowa, Warszawa; pzagra1@sgh.waw.pl, ORCID: 0000-0002-8257-4491

Purpose: The paper aims to identify types of airport non-aeronautical activities and assess their dependency on passenger traffic. The main objective is to explore how airports can develop revenue streams that are resilient to crises affecting passenger numbers.
Design/methodology/approach: The study uses a qualitative-analytical approach, combining literature review, authorial analysis of secondary sources, and empirical research through open-ended expert questionnaires. It systematically classifies 44 business activities across 14 sections of the Polish Classification of Activities (PKD), assessing their dependency levels on passenger traffic (none, partial, indirect, or direct).
Findings: Fifteen activities were identified as fully independent of passenger traffic, mainly related to airport surroundings (airport city), administrative, advisory, and e-commerce services. This reveals substantial potential for diversifying revenue sources. The study introduces refined dependency categories and highlights the need for broader airport business models beyond core operations.
Research limitations/implications: Findings are based on expert opinions and literature, so generally speaking may be limited. Some identified activities are still potential, not yet implemented. The assessment of dependency on passenger traffic was qualitative in nature and may vary depending on local conditions.
Future research should assess the efficiency and profitability of these independent revenue sources.
Practical implications: The study offers strategic insights for airport managers and regulators. It supports the development of resilient business models and recommends investing in airport city infrastructure, advisory services, and cargo-linked operations to ensure income stability during crises.
Social implications: By promoting sustainable and diversified airport operations, the research supports economic resilience and thus the preservation of jobs in times of crisis and aligns with environmental goals, such as green energy production and waste disposal.
Originality/value: This is the first holistic study that maps airport activities by dependency on passenger traffic. It provides a novel classification and practical framework for building crisis-resistant airport business models.
Keywords: airport business models, non-aeronautical revenues of airports, airport operations.
Category of the paper: research paper.

1. Introduction

European airports are facing serious challenges in the new circumstances of the post-pandemic era. While some have yet to rebuild traffic to 2019 levels some are expanding dynamically achieving growth of even more than 20% over pre-pandemic levels (Airportindustry-news.com, 2024). Such increases generate operational challenges. In addition, airports in Europe need to adapt to changes in market structure, including growth in the number of passengers served by ultra LCC carriers and changes in business travel demand (ACI, 2024). Other challenges include workforce assurance issues (TVP World, 2024) and new regulatory burdens resulting from the European Green Deal (Zagrajek, 2024). With operational challenges, cost pressures and the need for new capital expenditures, rebuild of the revenue base is one of the tasks that airports in Europe currently have to face It is also important to establish mechanisms that will enable airports to be resilient to future crises, including through the development of revenue sources independent of passenger traffic.

Based on the literature review, a research gap was identified, defined as the lack of holistic and cross-sectional studies on potential non-aeronautical airport activities and their dependency on passenger traffic.

The purpose of the article is to identify areas of the airport's non-aviation activities and how a particular activity is dependent on passenger traffic, thereby assessing how and in which areas an airport can reduce its reliance on passenger-related revenues and become more resilient to crises resulting from declines in passenger numbers.

2. Impact of Covid-19 pandemic on airport operations

Airport revenues are generally divided into two categories: aviation revenues (ICAO, 2020), which are directly related to flight operations, handling passengers and cargo at the airport, and non-aviation revenues, which include streams from other airport activities. Some studies also distinguish a third category of revenues, unrelated to airport operations, but these account for a negligible 5% share of the airport's total revenues (ACI, 2021b).

The analysis of airport revenues in the context of the COVID-19 crisis must begin with the decline in air traffic, which is the primary driver of airport income. The pandemic had a drastic impact on the global aviation market, causing passenger numbers to drop by up to 90% in the initial phase (Colak, Enoch, Morton, 2023; Janić, 2022). On average, passenger traffic in the European Union decreased by 73%, 64%, and 21% in 2020, 2021, and 2022 respectively, compared to 2019 levels (Statistica, 2024). In parallel, airport revenues fell sharply — for example, in 2020 they dropped by 69% compared to 2019 (European Parliament, 2021).

The COVID-19 crisis revealed airports' deep vulnerability due to their heavy reliance on air traffic-dependent revenue. While both aeronautical and non-aeronautical revenues declined during the crisis (Oxera, 2024), non-aeronautical revenues proved to be more resilient to air traffic drops (ACI, 2021b). The pandemic thus highlighted the need for revenue diversification and for strengthening non-aeronautical income streams (Colak et al., 2023; Oxera, 2024; Choi, 2021). It is worth noting, however, that the growing importance of non-aeronautical revenues had already been recognized prior to the pandemic (Graham, 2008; Fasone, Kofler, Scuderi, 2016).

3. Literature review

In the first stage of the study, a review of domestic and international literature was conducted to identify the current state of knowledge on non-aeronautical revenues generated by airports. The search was carried out in databases such as Scopus, Google Scholar, Ebsco, and BazHum, using the following keywords: "airport operations", "airport activities independent of passenger traffic", and "types of airport revenues". Priority was given to publications from the past 10 years (2015-2025), with the majority of sources dating from 2021-2024. In the second stage, selected publications from 2000-2014 were verified and included if they were still relevant and contributed significant value to the study. The review encompassed peer-reviewed academic articles as well as expert publications issued by industry organizations and consulting firms. Popular science articles and commentaries were excluded.

The literature review did not identify any publications that comprehensively addressed airport activities from a revenue perspective. Queries under terms such as "airport operations" returned results limited to operational activities. Analyses of non-aeronautical revenues typically focus on a few broad categories related to terminal-based activities, most often retail, food services, parking, leasing space, and advertising. Some authors presented more detailed breakdowns, such as types of retail points (Geuens, Vantomme, Brengman, 2004) or service offerings (Graham, 2008).

Certain works identified additional revenue sources related to terminal operations:

- Passenger services like information points or currency exchange (Geuens et al., 2004).
- Income from business lounges (Oxera, 2024).
- Casinos, swimming pools, karaoke, and other premium airport entertainment (Geuens et al., 2004).
- Wellness, fitness, or medical services (Graham, 2008).
- Additional offerings for visitors (Graham, 2008).

The literature also refers to activities not directly linked to the passenger terminal:

- Ground handling services, such as fuel delivery (Oxera, 2024; WSP, 2022).
- Logistics centers and air cargo handling (Graham, 2008).
- Renewable energy production (Oxera, 2024).
- Services for airport employees (Graham, 2008).

Special attention in the literature is given to the use of land surrounding airports (airport city) to generate non-aeronautical revenues (Graham, 2008; WSP, 2022; Rucińska, Ruciński, 2008). Among the available studies, Rucińska and Ruciński (2008) most comprehensively describe possible types of activity in this area, including shopping and service centers, entertainment centers, galleries, business and logistics parks, conference and congress centers, exhibition and trade fair venues, and hotel and recreational facilities.

However, the available studies only marginally address the potential for generating non-aeronautical revenues in relation to passenger traffic, mainly focusing on airport city functions (WSP, 2022; Hirth, 2020).

In summary, the literature review reveals a significant gap in research on types of airport activities. There is a lack of studies that comprehensively identify sources of airport revenue. Moreover, existing studies rarely examine the potential of non-aeronautical activities that are independent of changes in passenger traffic. Based on the literature review, a research gap was identified, defined as the absence of holistic and cross-sectional studies on possible non-aeronautical airport activities and their dependency on passenger traffic.

4. Methods

The study had a qualitative-analytical character and was conducted in three interconnected stages: a literature review, the author’s own analysis based on selected source materials, and empirical research using an original questionnaire with open-ended questions. The goal of this process was to obtain an in-depth, multifaceted diagnosis of the phenomenon under investigation, taking into account both the theoretical perspective and the experiences and opinions of the respondents.

In the first stage, a review of domestic and international literature was carried out to identify the current state of knowledge on the research topic. This was supplemented by an analysis of online sources, including official airport websites and financial reports. The aim of this stage was to gather data on non-aeronautical activities conducted by airports.

The empirical research was carried out in two stages using two separate questionnaires. It was conducted using purposive sampling and involved eight respondents. The selection criteria included the respondent's position, professional experience, and the organization they represented. The respondents were aviation industry experts involved in non-aeronautical

revenue activities. They were selected specialists with extensive professional experience and specialized knowledge in the studied area. Their expertise covered terminal commerce, cargo, MRO, parking, airport city development, and other airport operations. The respondents represented various organizational levels, from board members to specialists. This sample selection allowed for the collection of in-depth, qualitative responses that provided insights into a wide spectrum of the subject matter.

The first stage of the empirical study took place in September 2024. The questionnaire included areas of airport activity identified in stages 1 and 2 of the study. It contained two questions: one regarding additional airport activities known to the respondent but not yet identified in previous stages, and the other concerning the degree of dependency of airport activities on passenger traffic. Respondents emphasized that this dependency could not be described in binary terms. In addition to full dependency or independence, there are partial and indirect dependencies. For instance, some activities may be only partly dependent on passenger traffic and could still generate income from other sources if passenger operations are reduced or halted. An example is ground handling services, which could still serve cargo flights. Indirect dependency occurs when an airport client's business is directly tied to passenger traffic—for example, retail space rental in passenger terminals[i]. A decline in traffic could prompt tenants to seek rent reductions or rent suspension. Ozlem, Enoch, and Morton (2023) noted that such practices occurred during the COVID-19 pandemic, which was also confirmed by the respondents.

The second part of the survey was conducted between mid-October and mid-November 2024. It used a second questionnaire containing a list of airport activities identified in previous research stages. Respondents asked to indicate the type of dependency between each activity and passenger traffic. Respondents were also asked whether they could identify any additional elements that should be considered in the analysis of revenue dependency on passenger traffic.

5. Results

It should be noted that respondents paid particular attention to the types of business models for conducted activities. Based on literature sources (Graham, 2008) and expert responses, it can be stated that airports may operate under four basic models, although not every model applies to each type of activity. Airports may offer services directly, or they may engage an external entity that manages a given project/infrastructure for a fee. Airports can also conduct an activity jointly with another entity based on a joint venture, or the activity may be carried out exclusively by a third party under a concession or lease agreement. For example, an airport may provide apron handling services through its own structure, such as Wrocław Airport, but this can also be performed by an independent company, such as LS Airport Services in Warsaw.

Based on the above, the author outlined activities under possible business models. The data obtained from the study were systematized using the Polish Classification of Activities (PKD) (Journal of Laws 2007, No. 251, item 1885). Based on the research, the author identified that an airport can engage in activities classified under as many as 14 out of 21 sections. The results are presented in the table below. The first column indicates the PKD activity section, the second the type of activity, and the third the level of dependency on passenger traffic, marked as follows:

N - no dependency.

C - partial dependency.

P - indirect dependency.

B - direct dependency.

The fourth column lists examples of airports where the activity is implemented. In some cases, examples include activities not directly conducted by the airport authority but by agents (e.g., handling agents). Such activities may also be run by the airport authority. In specific cases, examples of non-profit activities with commercial potential are provided.

Table 1.
Sources of non-aeronautical airport revenues along with their dependence on passenger traffic

Section	Type of Activity	Dependency	Airport Examples
C	Food production for inflight catering	B	MUC, LHR
	Recovered glycol production for aircraft de-icing	C	ARN
	Industrial production	N	BHX, MXP, WAW
D	Electricity and heat production[ii]	P/B	GDN, AMS
E	Water supply and waste/sewage management for tenants	P/B	Common
F	Construction of various facilities[iii]	P/N	ORY, KRK
G	Retail within the passenger terminal	B	Common
	Retail in airport city	N	ZRH
	E-commerce[iv]	N	LHR, FRA, CPH
	GSE equipment service and maintenance[v]	C	WAW
H	Ground handling[vi]	C	Common
	Transport services to/from the airport[vii]	C	LHR, RDO
	Train/bus terminal as final stop	B	WAW
	Train/bus terminal as transport hub	C	AMS
	Taxi, car rental, car sharing	B	Common
	Road freight transport for air cargo	C	WAW
	Supply transport for terminal tenants	B	LHR
	Passenger parking, incl. shuttle transport	B	Common
	Air cargo storage and handling	C	BUD, BRU, AMS
	Logistic services in airport vicinity	N	CDG, AMS
	Storage/logistics for terminal supply	B	LHR, AMS
G	Food services in terminal	B	Common
I	Food services in airport city	N	ZRH
	Hotel operations in public zone[viii]	C	AMS, FRA, MUC
	Hotel operations in restricted zone	B	CDG, BCN, FRA
	Business lounges	B	WAW, AMS, PRG
	VIP/CIP services[ix]	B	WAW
	Fast track services	B	WAW

Cont. table 1.

J	Telecom services	P	Potential
	Data sales	N	Potential
L	Rental space in passenger terminal	C	WAW
	Rental space in airport city	N	AMS
	Real estate trading and development	N	FRA
	Airport management services[x]	N	Common
	Infrastructure management services	N	FRA
M	Consulting services	N	MUC
	Advertising[xi]	P	WAW
N	Exhibition and trade show spaces	N	BER
	Equipment leasing	C	LTN
P	Training[xii]	N/C	SIN, ICN, MUC, IST
Q	Medical services	N	MUC
R	Entertainment	B	LHR
	Fitness and wellness centers	B	ZRH

Source: Own elaboration based on conducted research.

Based on the conducted study, the author identified 44 types of potential activities that airports can undertake. As previously mentioned, these activities span as many as 14 sections of the Polish Classification of Activities (PKD). In 17 cases, the dependency on passenger traffic was direct. Partial and indirect dependencies were identified in 11 and 5 activities, respectively. No dependency was identified in 15 cases. It is noteworthy that the activities not dependent on passenger traffic can be grouped primarily into two categories: ventures implemented as part of the airport city and those of an administrative or advisory nature. These represent areas beyond the airport's core functions, which can be defined as passenger handling, cargo services, and flight operations. The only potential activity directly related to core airport operations is e-commerce, excluding order pickup services at the airport. When analyzing partial and indirect dependencies, they are mainly observed in areas connected to ground handling, particularly when linked to cargo traffic or related services.

6. Discussion

The findings of the study highlight the significant potential of airports in developing activities independent of passenger traffic. Identifying 44 types of activities, 15 of which show no direct or indirect link to passenger traffic, represents a major expansion of existing knowledge. A crucial element of the findings is the classification of activities based on their level of dependency on passenger traffic. The introduction of the concepts of partial and indirect dependency enables more precise modeling of revenue sensitivity to fluctuations in air travel demand. This approach extends previous literature, which to a limited extent, addressed the relationship between passenger traffic and airport revenues.

The conclusions concerning airport city-related activities, e-commerce and administrative/advisory services have particular practical relevance. These segments - according to the findings - show the least dependence on passenger traffic, yet offer considerable growth potential and possible high added value. Although such activities have been noted in the literature e.g. airport city (Rucińska, Ruciński, 2008; WSP, 2022), they have not previously been the subject of a comprehensive, cross-sectional analysis.

The study also contributes to the ongoing discourse on airport business models. The analysis from the perspective of four organizational variants (in-house operation, outsourcing, partnership, concession) and their applications in different economic contexts shows that not only the range of activities but also the method of implementation may significantly affect an airport's flexibility and financial resilience. This perspective may feed future development strategies, particularly in the context of building resilience to crises similar to the COVID-19 pandemic.

In the context of prior research this study enriches the literature with a practical catalog of activities along with their assigned dependency level on the key market factor - passenger traffic.

7. Summary

The study made it possible to achieve the objective of the article, namely identifying the areas of airport non-aeronautical activities and determining the extent to which each activity depends on passenger traffic. This, in turn, allows for an indirect assessment of the degree and scope to which an airport can reduce its reliance on passenger-generated revenues and enhance its resilience to crises resulting from declines in passenger numbers.

The research revealed that airports, in terms of non-aeronautical revenues, currently operate or could operate in 14 out of the 21 sections of the Polish Classification of Activities (PKD), which indicates significant potential for revenue diversification. On the other hand, this requires airports to develop a broad and complex set of competencies and resources. The study also confirmed the strong dependency of core airport revenue on passenger traffic. Therefore, to build financial resilience to future crises, airports should particularly focus on expanding their activities in the broadly understood airport city area, as well as in administrative and consulting services, alongside cargo-related operations.

It should be emphasized that the research provides valuable insights for both airport operators and aviation market regulators. From the perspective of airport management, it identifies key directions for the development of activities independent of passenger traffic, which may serve as a foundation for building more resilient business models and strategies. The study results may also inform the development of regulations that support greater airport

independence from fluctuations in passenger markets, including by facilitating the development and management of surrounding land and promoting renewable energy production.

These findings lead to the conclusion that further research is needed in this area, particularly in evaluating the efficiency of revenue sources independent of passengers, the role of airport-adjacent areas, and their integration into broader urban economic ecosystems.

Despite the broad scope of the study, certain limitations must be acknowledged that may affect the interpretation of the results:

- The research was based on expert analysis and a review of available sources, which may limit its full representativeness.
- Due to the specific nature of the market, not all activities have been confirmed in practice - some remain potential.
- The assessment of dependency on passenger traffic was qualitative in nature and may vary depending on local conditions.

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Footnotes

[i] A specific case of such dependency is the lease of space for retail stores, which is based on two types of fees. The first is the so-called MAG (Minimum Annual Guarantee), i.e., a fixed price for the rented space. The second component is a share in the tenant's turnover. In this case, a lack of traffic primarily reduces the airport's revenue from the turnover component, and may later lead to a total loss of income due to the suspension of the MAG component.

[ii] Especially from renewable energy sources, e.g., photovoltaic farms and geothermal wells.

[iii] Related directly to airport operation (e.g., passenger terminal, airport maintenance base, multi-level parking) and other facilities, e.g., hotels, office buildings.

[iv] E-commerce belongs to section Z, but the author included it here for organizational reasons.

[v] Ground support equipment – vehicles and devices used for ground handling.

[vi] These involve numerous processes related to passenger and cargo flow handling at the airport and flight operations. Ground handling is an integral part of this process and includes 11 categories of services. It applies to both passenger and cargo operations.

[vii] Connections to/from the airport also serve other people besides passengers, especially airport employees. Therefore, a drop in passenger traffic does not eliminate demand for such services, as they may be used by staff essential for basic airport operations or cargo handling.

[viii] Although the hotel offer is available to all potential guests, a significant group are passengers before, during, or after travel. Hotels in public areas also serve as accommodation in case of flight disruptions (cancellations, delays).

[ix] Very Important Person – often part of government or state delegation; Commercially Important Person – a client willing to pay a premium for high-end services. Airports provide separate infrastructure for processing such passengers and baggage, including security, border control, and rest zones. An example is the VIP Terminal at Warsaw Chopin Airport.

[x] In Europe, ownership, co-ownership or concession-based airport management is common, e.g., Vienna Airport, Fraport.

[xi] Airports enable advertising campaigns on media along access roads, in public areas, restricted areas, and airside – visible from aircraft windows. They also allow product exhibitions (e.g., cars) and promotional events.

[xii] Airports also run extensive training operations. Apart from internal training, they provide it to external entities.